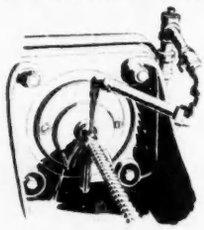
AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

APRIL 10, 1937

RIGHT DOWN YOUR ALLEY



A BROACHING OPERATION FEASIBLE ONLY THROUGH RIGHT LUBRICANT

Frequently, changes in a production cutting operation bring unexpected grief.

In one instance a broaching operation was designed and the broach produced at a cost of nearly $900, only to find that tool maintenance costs were prohibitive. After only a short period of operation costs were figured as follows:

Number of pieces per grind	250
Maximum broach life	5 grinds
Pieces per broach	1250
Cost of broach	$ 900
5 grinds at $75 per grind	375
	$1.275
Cost per piece	$1.00

Methods were frantically reviewed. Mechanical design could not be improved. Then a Standard Lubrication Engineer was called—the last hope of help from the cutting lubricant.

After a thorough analysis a special cutting fluid was developed and a record made of costs as follows:

Number of pieces per grind	5000
Maximum broach life	5 grinds
Pieces per broach	25,000
Cost of broach and grinding	(*as above*) $1,275
Cost per piece	5 cents

This is an unusually large saving, but it is typical of the possibilities for reducing cutting, grinding or forming costs through the use of your Standard Lubrication Engineer and the wide range of Standard Products, including:

ACME CUTTING OIL
PREMIER CUTTING OIL
SUPERLA SOLUBLE OIL
STANDARD PASTE COMPOUND
STANOSTAMP

Ask for this Booklet

"LUBRICATION IN GEAR CUTTING OPERATIONS"

It discusses the various methods of gear forming and the modern trend to high speed production. It outlines the basic requirements of cutting lubricants and describes where straight mineral oils, sulphurized mineral oil, soluble oils and paste compounds meet general gear cutting requirements. Ask for it or other booklets listed. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois.

"Lubrication in Honing and Lapping"
"Lubrication in Grinding Operation"

"Sure, you know Jack-

he's SAVED this company PLENTY!"

"That's Jack, the Standard Lubrication Engineer—he's a real asset to this plant. We first met him the time we had so much trouble with the bearings on No. 2 engine. I'll never forget it. He looks like a white-collar guy—but you should have seen him that day. He was right in there every minute—and grease up to his ears. He sure pulled us out of a hole. He's been 'Jack' around here ever since—and just between us, he's meant 'jack' to this plant."

Multiply this opinion by hundreds, even thousands, and you will have an idea of the friendliness with which Standard Lubrication Engineers are received throughout their territory. And it's only natural. Standard Lubrication Engineers have a service to give you. A helpful service. Their one interest—to cut your lubrication costs . . . their sole reward, your satisfaction with the lubrication in your plant and the Standard Oil products you use.

Do you know *your* Standard Lubrication Engineer? By all means get acquainted; it will be profitable to you. Call your local Standard Oil (Indiana) office and ask for a Lubrication Engineer.

STANDARD OIL COMPANY (INDIANA)

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AUTOMOTIVE INDUSTRIES
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Reg. U. S. Pat. Off.
Published Weekly

Volume 76 Number 15

Contents

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AUTOMOTIVE INDUSTRIES

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April 10, 1937

This Week

There are a lot of things being done at the Olds research laboratory that will determine many features of the car you will drive in years to come. See page 554.

And now it is air conditioning for buses. The White and Nash-Kelvinator organizations have cooperated in building an experimental bus that is fully described in the article starting on page 559.

The development of automatic transmissions is a story of intense interest particularly at this time. If you will turn to page 561 you will find an article that is not only instructive but engrossing.

Operations Speeded Up

Car Output of 550,000 Likely for April, Highest for Any Single Month Since 1929

By Harold E. Gronseth

With another major strike settled and the prospect of more peaceful relations with labor, the automobile industry goes into its most active selling season prepared to match peak demand for its product with maximum output. As it appears now, the last half of April will see the entire productive facilities of the industry employed to the fullest extent. Unless unforeseen interruptions develop, production in the last two weeks of April will be at the monthly rate of 600,000 units and, despite the loss of a considerable portion of the month by strike involved plants, this month should roll up a bigger output total than any month since 1929.

No reliable estimate can be made at this time of the current month's production since it is not known how soon the recent strike-bound plants can return to full scale operations, but it is highly probable that a total of 550,000 units will be reached. Some companies have advanced their April schedules over March. Others, already at top speed, are carrying on at that rate. And it is certain that the companies which lost time by reason of recent strikes, will be straining every facility to catch up on unfilled orders that have been piling up. Before the month is out, the industry will be producing at the rate of around 28,000 vehicles daily, barring of course further important interruptions which now seem less likely than at any time since current models began coming off the lines.

March output for the U. S. and Canada easily crossed the half-million

(Turn to page 548, please)

Union Yields to Chrysler

With Abandonment of Exclusive Bargaining Clause, Negotiations Resume on Same Basis as Before Strike

Their 30-day strike settled, Chrysler officials went into conference at once to work out plans for reopening idle factories that would return to work some 60,000 employes. It was expected about 10 days would be required to get the plants going at full production.

"We want to get our plants into production as soon as possible," said B. E. Hutchinson, chairman of the finance committee. "However, it is a considerable job to reopen plants which have been closed for exactly a month because there are innumerable technical details that have first to be overcome." He was unable to state whether the assembly lines would be in operation by Monday, but said some men will be working this week.

State police, who have been guarding the factory gates since sitdown strikers evacuated the plants March 25, have been removed.

In accordance with the strike settlement agreement, union leaders met with Chrysler officials Thursday to resume negotiations which were broken off when W. P. Chrysler and John L. Lewis met in Lansing to settle the main issue of exclusive bargaining.

It is hard to see how the status of the union in its relations with the Chrysler Corp. has been changed by the month-long strike. That is, the conferees resume their negotiations of minor points with the union representatives still bargaining only for their members as they did before the costly strike was started.

Commenting on the agreement, Hutchinson said: "The union can raise any question it wishes in the supplementary negotiations provided for in the agreement. We said before the men went on strike that we would talk things over with the men at any time and we are going to do it now. It is a non-exclusive agreement; nobody has asked us for a conference, but there is nothing in the agreement to prevent it.

"There is no provision for a wage increase," he pointed out. "There will be no wage increases except as the corporation deems proper and conditions warrant."

Referring to the bargaining agen-

(Turn to page 544, please)

Graham-Paige Reaches Agreement with UAW

Negotiations between Graham-Paige Motors Corp. and the United Automobile Workers union which have been going on for several weeks, were successfully completed this week with the signing of an agreement which provides for: an eight-hour day; 40-hour week; time and one-half for overtime; 75 cents an hour minimum for men and 65 cents for women; the union to represent employes who are members of the UAW.

The agreement, for no stated period, gives either party the right to terminate, cancel, or to amend upon 90 days' written notice.

Because of the unusually friendly relations which have always existed between the management and the workers, manufacturing operations went on without interruption or loss in wages or production.

Union Yields to Chrysler

(*Continued from page* 543)

cies in Chrysler plants created under the Wolman labor board, Hutchinson said: "Some of the board members have already submitted their resignations. They will be accepted. However, everybody didn't resign. Frankly, the last thing we are trying to do is to get legalistic about this agreement. However, if any of those who have not resigned represent any of our employes, we can bargain with them.

"This agreement expresses our labor policy as it exists today and as it existed before the strike. This is a comprehensive agreement, and under it we will treat all of our workmen alike."

As might be expected, the union placed a different interpretation on the agreement. They lean heavily on the clause which says: "The corporation will not aid, promote or finance any labor group or organization which purports to engage in collective bargaining or make any agreement with any such group or organization for the purpose of undermining the union."

Homer Martin contends that the agreement means abolition of the plant bargaining agencies, and gives the UAW sole bargaining rights, to all intents and purposes. This is in spite of the fact that the first sentence of the agreement clearly states that: "The corporation agrees to bargain with the union as the collective bargaining agency for such of its employes as are members of the union."

Said Mr. Martin: "It definitely places the union in a position of responsibility and of exclusive privilege in bargaining with the corporation."

"Members of the union asked the bargaining committee to bring back sole collective bargaining rights, which the committee did, although the Chrysler Corp. insisted on face-saving language," was Richard Frankensteen's comment. He said that the corporation would be unable to deal with any other union—"That would be undermining the UAW." Establishment of any new unions in the plants would be a clear case of undermining, he explained. The corporation cannot sponsor works' councils or other types of bargaining agencies, according to Frankensteen. "Aside from the fact that 103 out of the 120 members of the Chrysler bargaining boards sent in their resignations, the agreement clearly prohibits the company from dealing with such agencies, should any new ones be formed," he said.

In his opinion, the phrase pledging the corporation not to "make any agreement with any such group or organization for the purpose of undermining the union," would also preclude agreement with any labor organization other than the UAW, whether AFL craft organization or independent.

A summary of the principal provisions follow:

1. The Chrysler Corp. promises it "will not aid, promote, or finance any labor group or organization" or any other union which might "undermine" the United Automobile Workers.

2. The UAW agrees that "neither it nor its members will intimidate or coerce employes" and also not "to solicit members on corporation time or plant property."

3. They mutually agree the terms "employe" shall not include foremen, assistant foremen, timekeepers, plant protection employes or confidential salaried employes.

4. The corporation recognizes the UAW as the collective bargaining agent for its members employed by Chrysler and also "recognizes and will not interfere with the rights of its employes to become members of the union.

5. Company and union agree to resume negotiations in Detroit April 8 on supplementary agreement.

6. Union agrees to end strike immediately.

7. Corporation agrees to put plants closed by strike back into operation as soon as possible.

8. Corporation agrees to reemploy workers as rapidly as possible with no discrimination against those on strike and with recognition of the seniority rule now in effect.

9. Corporation and union agree to ask Circuit Court to dismiss Chrysler injunction and union cross bill.

10. The agreement and supplementary agreement will remain in force until March 31, 1938.

More GM Strikes

A flurry of sitdown strikes closed a dozen General Motors plants late last week. Unauthorized strikes had been responsible for the stoppage of the nine Chevrolet plants and one Fisher Body unit in Flint, and GM Truck, Pontiac Motor and Fisher Body plants in Pontiac. More than 39,000 workers were temporarily idle.

International officers of the United Automobile Workers union rushed to the trouble zones and managed to persuade strikers to evacuate the plants. The Flint disturbance occurred because of union employes' dissatisfaction with representation through the shop steward system, while in Pontiac, in addition to this complaint, there were charges of discrimination and unfair discharge.

Losing patience with recurrent stoppages of work by sitdowners, in violation of the March 12 agreement with the union, GM officials took the union to task for failure to live up to its part of the bargain. At their hurriedly called conference on Thursday last week, W. S. Knudsen handed Homer

C. B. VEAL, research manager, Society of Automotive Engineers, Inc., was special editor for automotive engineering terms on the 1937 edition of Webster's New International Dictionary of the English Language.

JOHN L. COTTER has been appointed secretary and treasurer of the Hupp Motor Car Corp. For the last five years Mr. Cotter has been vice-president and general manager of the Crittall Manufacturing Co., with headquarters in Detroit and Washington, and was previosuly vice-president of the Union Guardian Trust Co. of Detroit.

JOHN S. WORLEY, professor of transportation engineering at the University of Michigan, has been appointed chief of the technical staff of the American Safety Institute by Earl J. Smith, president of the institute. Professor Worley is an outstanding authority on safety engineering and has made traffic surveys in many of the leading cities of the country. The institute specializes in eliminating hazards at grade crossings.

WILLIAM E. FERMANN, naval architect, formerly with the Matthews Boat Co., Hacker & Fermann, Inc., and recently with Cox & Stevens, has become associated with the marine division of the Federal-Mogul Corp., Detroit. He will be in charge of propulsion engineering.

P. H. STAERK has been appointed manager of the industrial division in charge of distributor and production sales of mounted bearings of the Ahlberg Bearing Co., Chicago. He has been with the company since starting as a salesman in 1920.

GM March Sales Pass Last Year's

Total Reaches 260,965 with Past Five Months Better Than Same Period of Previous Year

World sales of General Motors cars jumped back in March from the February low point caused by the strike tie-up and were over 64,000 higher than in March of last year. In spite of the strike's effects, sales for the first five months of the current model year were higher than they were during last year.

Sales to foreign dealers in March were more than 10,000 units above those of March, 1936, and were almost 20,000 higher for the five-month period.

The accompanying table gives further details of General Motors sales:

	March, 1937	Feb., 1937	March, 1936	First 5 Months of Model Year 1937	First 5 Months of Model Year 1936
Sales to world dealers	260,965	74,567	196,721	870,034	868,619
Sales to U. S. dealers	216,606	49,674	162,418	690,287	708,173
Sales to U. S. consumers	196,095	51,600	181,782	669,717	639,007
Change in U. S. dealer stocks	+20,511	—1,926	—19,364	+20,570	+69,166
Sales to foreign dealers	44,359	24,893	34,303	179,747	160,446

Martin a letter of protest, calling attention to the numerous interruptions to operations which have occurred since the agreement was signed.

The letter listed 30 stoppages of work in 10 GM plants since March 12, resulting in the loss of 413,867 man hours and affecting 48,570 employes. "Demand is hereby made," said Knudsen in his letter, "that responsible authorities of the union take the necessary steps to see to it that its obligations are observed by its members, and stoppage of production cease. Agreements not lived up to are no agreements."

Knudsen further charged that the "obligation of the union against the use of intimidation or coercion has been repeatedly violated despite its pledge embodied in the agreement of Feb. 11."

The ZIS is the latest type of passenger car being produced in the U. S. S. R. The name is taken from the initials of the Stalin automobile works in Moscow where it is built. The car is powered by a 110-hp. eight-cylinder engine

Sovfoto

First Ford Sitdown

The sitdown strike hit the Ford Motor Co. for the first time April 2 when its assembly branch in Kansas City was forced to close. The plant had been running ahead of schedule and a temporary lay-off of 200 to 300 men had been ordered. Suspecting discrimination in the lay-off, UAW members started a sitdown strike. An estimated 600 or more workers remained in the plant behind welded and barricaded gates. But within an hour after the arrival of UAW vice-president Ed Hall the men evacuated the plant and negotiations were started. On the same airplane with Hall, rushing to Kansas City, were five representatives of the Ford Motor Co., members of Harry Bennett's staff. The plant resumed operations Monday.

Prompt evacuation of the Ford plant and warnings issued by union leaders to GM strikers is taken by some as an indication that the union is changing its attitude on the sitdown technique, prompted no doubt by growing criticism of this tactic by the public and the recent furore it has created in Congress. Renewed outbreaks in GM plants, moreover, tended to weaken the bargaining position of the union in Chrysler conferences.

Cautioning union members against unauthorized strikes, Ed Hall said: "Sitdown strikes should be resorted to only when absolutely necessary. The decision should be made by the international union, not the local strike committee. A mere handful, with grievances, can cause untold hardships to thousands of workers."

A crowd of union workers that overflowed the great coliseum at the state fair grounds in Detroit Wednesday night heard John L. Lewis exhort workers to keep all agreements between the union and managements and refrain from unauthorized sitdown strikes. In fact, the sanctity of agreements and disapproval of "wild cat sitdowns" was the theme of the speakers for the evening.

Discussing the Chrysler settlement, Lewis said: "Your union has pledged during the life of the agreement that there will be no stoppages, and this means there will be no sitdowns, walkouts, stay-ins, or stand-ups. It means it will provide ways and means to settle any controversy.

"Make this collective bargaining agreement with the Chrysler Corp. a success," he urged. "When Chrysler gives his word, I am confident that he will carry it out," Lewis added.

Referring to a statement quoting Henry Ford to the effect that his company would never recognize the UAW or any other union, Lewis declared: "I have no doubt that Ford will change his mind. Why, for instance, if the Supreme Court on Monday should validate the Wagner Act, Henry would be in a bad fix. I want to tell you men in the Ford plants to organize and for you others to tell Ford workers to organize. But tell them to wait until they are organized before they undertake to engage Ford in a conversation."

He predicted that the membership rolls of the CIO will exceed the rolls of the American Federation of Labor within the next 60 days.

Homer Martin also cautioned against unauthorized sporadic strikes and with reference to the Chrysler pact said: "We do not want you to accept an agreement with your fingers crossed. We know that you feel an agreement is an agreement, and it must be executed by those who enter into it." He said the union had signed agreements with 100 large corporations and the membership has been pushed beyond 300,000 nearly 150,000 of which are in Detroit.

Reo Peace Signed

Settlement of the 30-day strike of the Reo Motor Car Co. was reached April 7 with an agreement basically the same as that which ended the Chrysler strike. In fact, it was expected that the Chrysler pact would establish a formula for settlement of both the Reo and Hudson disputes. After disposing of the Reo difficulty, Governor Murphy and Federal Conciliator James Dewey tackled the Hudson Case, and after a preliminary meeting were to confer again with representatives of both sides April 8. The principal issue in all three strikes was that of exclusive bargaining. As with Chrysler, supplementary negotiations over details not covered in the main agreement will be carried on without interfering with operations of the plants.

Evacuation of the Reo plant began late Wednesday and production is to be resumed as soon as plants can be placed in condition. President D. E. Bates estimated that it might take a week to get production in full swing again. "The agreement is regarded as eminently satisfactory by both parties," said Bates.

According to UAW President Homer Martin, the Union has no plans for a move against the Ford Motor Co. "If we ever do decide to strike at a Ford plant, our first step will be to communicate with Ford and give him an opportunity to do what is right and present his side of the question," said Martin. "That is not being done now," he added. Although a second short-lived strike occurred in a Ford plant, the two were not the start of a union drive against Ford. The latest difficulty was at St. Louis where UAW members in the Ford assembly plant stopped work in protest against the discharge of 11 men. The difficulty was quickly ironed out.

Covered Wagon Concludes Agreement with Workers

An agreement whereby factory workers of Covered Wagon Co., Mt. Clemens, Mich., trailer coach manufacturers, will receive an increase in pay has been signed by the company and the Covered Wagon Workers' association.

At a meeting last week the employes voted to accept the proposal of the company to limit working hours to eight hours a day as standard, provide time and a half compensation for overtime work for all productive workers, and arrange a new classification under which workers would be given an increase in pay. The company also granted a closed shop agreement to the organization.

Lower Canadian Tariff

Automotive Parts and Special Steels to Benefit

Reduced tariffs on several items in the automotive schedules have been announced at Ottawa, Ont., by Hon. Charles Dunning, Finance Minister of Canada. He gave notice of his intention to amend the tariff schedules at a later date in the session to give effect to the changes which affect automobile parts, among other things.

In regard to automobiles and buses, the duty is lowered on many parts or they are placed on the free list to cheapen the cost of domestic production. It will be recalled, however, that the tariff board criticized the differential in the cost of the same makes of cars in the United States and Canada and suggested that if the disparity is not rectified the government might reduce or remove the duty.

Reduction of the automotive schedules was chiefly to make it cheaper to import parts used in the manufacture of cars, trucks and buses. One of the important changes was to allow free entry for steel used in the manufacture of cars when it is of a class or kind not produced in Canada. It will come in free from Great Britain and the United States. Formerly the tariff was as high as $4 a ton against Britain and $8 a ton against the United States. It is estimated that 500 lb. of such steel is used in the construction of the ordinary car.

Special relief has been extended to makers of trucks and buses. They formerly got the lowest rates of duties on goods imported if they could show that 50 per cent of the finished product was Empire content. This has been reduced to 40 per cent as experience showed it was more difficult to have high Empire content in trucks and buses than in passenger cars.

Stutz Files Petition Under Section 77-B

Officials of the Stutz Motor Corp. of America filed a debtors' petition in federal district court at Indianapolis, April 2, seeking permission for reorganization under section 77-B of the national bankruptcy act.

According to the petition, filed by Charles O. Roemler, Indianapolis attorney, liabilities of the firm are listed at $732,892 and assets at $1,179,066. One of the largest items of the liabilities was given as $266,000, owed to the Reconstruction Finance Corporation. This was given as the balance on a $1,000,000 loan. Outstanding sinking fund bonds were listed at $156,000.

The Stutz Company has been manufacturing a light delivery vehicle known as the Pac-Age-Car since January, 1935. The petition pointed out that further production is impossible under the present financial set-up. It contended that a number of banks have shown a willingness to advance money to the company if a suitable reorganization plan can be worked out. Stutz officials report that 400 orders for Pac-Age cars are on hand at present with almost an equal number in prospect.

The proposed reorganization plan will be presented in federal district court by April 12, it is believed. Approximately 2000 stockholders are on the books of the company at present with approximately 40 bond holders given.

Francis F. Prentiss

Francis F. Prentiss, chairman of the board of directors of the Cleveland Twist Drill Co., Cleveland, Ohio, died of pneumonia at his winter home in Pasadena, Calif., on April 1. Mr. Prentiss had been in ill health for several months prior to his death. He was 78 years of age.

Mr. Prentiss became associated with what is now the Cleveland Twist Drill Co. in the summer of 1880. Several years prior to his death, Mr. Prentiss had retired from active management of the company, in order to give his entire time and attention to a wide range of civic affairs and philanthropies in which both he and Mrs. Prentiss were keenly interested.

Tractor Production in U. S. Reached 227,185 Last Year

Production of tractors, combines (harvester-thresher) and grain threshers increased sharply during 1936 over the previous year, according to the reports made public this week by Director William L. Austin of the Bureau of the Census, Department of Commerce. These statistics are preliminary and are based on returns received to date in the annual canvass of manufacturers of farm equipment and related products.

Tractors manufactured in 1936 numbered 227,185 and were valued at $176,504,994, compared with 161,131 tractors produced in the previous year at a value of $121,300,672. Manufacturers sold 19,801 tractors for export during 1936 compared with 10,976 during the previous year.

Chevrolet Gets Army Order

The Chevrolet division of General Motors Corp. at Flint, Mich., has received a War Department contract for 184 trucks for $170,221 and the Chevrolet division of Norwood, Ohio, received a contract for 80 ambulances for $95,559, it was reported this week.

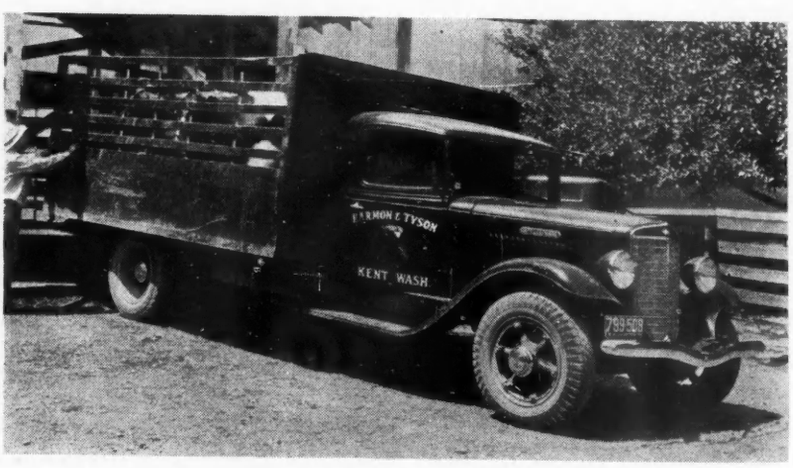
More Stock Goes to Market in Trucks

Since 1916 Percentage of Total Livestock Receipts Rose from 1.61 to 54.85 Last Year

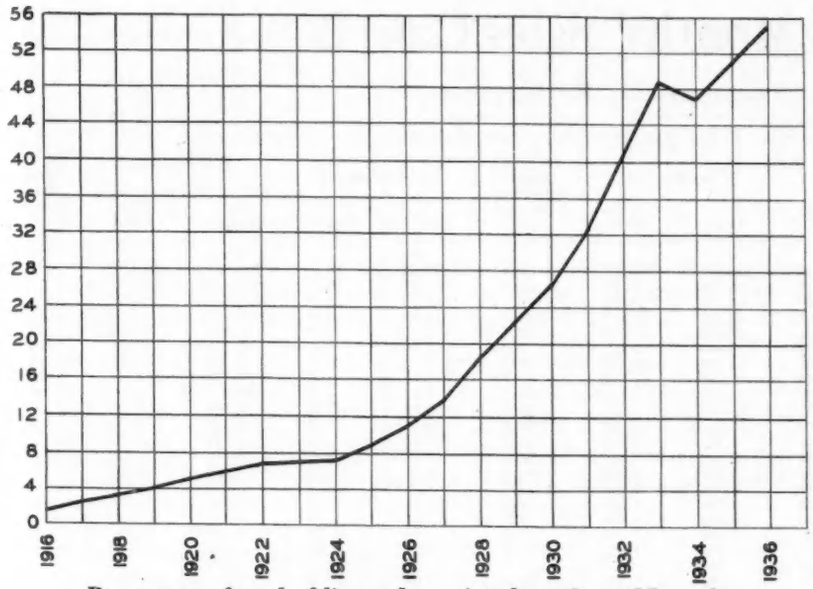
The decided trend toward motor trucks for livestock hauling is again spotlighted in a recent annual government statistical summary. For a number of years the Bureau of Agricultural Economics of the United States Department of Agriculture has been issuing in mimeograph form a yearly tabulation entitled "Driven-In Receipts of Livestock."

Among the many interesting tables appearing in this annual compilation, one containing figures on "Receipts and Number and Per Cent of Drive-Ins" at 17 markets combined, 1916 to 1936, inclusive, is particularly significant. This table not only contains annual figures of total receipts, drive-ins and percentages for the four separate groups of livestock—cattle, calves, hogs, and sheep and lambs—but also a combined total of yearly receipts, total yearly drive-ins and percentages.

Based on figures in this table, the percentage yearly drive-ins (all groups of livestock) are of total yearly re-



Cattle are brought to market by a Kent, Wash., firm of livestock dealers in an International 1½-ton truck equipped with stock rack



Percentage of total of livestock receipts brought to 17 markets by motor trucks is shown in the accompanying chart

ceipts, the accompanying graph was plotted. This graph shows that for 1916 the per cent figure was a mere 1.61 and for 1936 it had risen to 54.85. In other words, total drive-ins by motor truck in 1916 were 984,559 out of total receipts of 61,100,023, while in 1936 total drive-ins by truck had increased to 27,104,590 out of total receipts of 49,418,327.

From this it can be seen that motor trucks are playing a very important role in the livestock industry, an industry that accounts for a large proportion of farm income. Farmers' cash income from livestock and livestock products in 1936 represented 56 per cent of the total.

The motor truck has won a special name for itself in this big job of hauling livestock because it is such an efficient time-saving unit. With the motor truck the farmer can quickly get a load of stock on its way to market to cash in on favorable prices reported to him by radio or telephone. Less handling of the stock, more careful and quieter loading and unloading, ability to make quick runs at night in hot weather, smoother transit made possible nowadays by better highways, adequate springs, pneumatic tires, and efficiently arranged bodies are also considered by farmers as definite advantages of the automotive method of livestock transport. Again, by the use of motor trucks smaller shipments may be profitably made and so mixture of strange animals is not necessary and farmers can spread out their shipments, sending stock only to market when fully fattened and thus able to bring higher figures.

Motor trucks are essential equipment in hauling many other kinds of farm produce. Some 25 per cent of all motor trucks are employed in the agricultural industry. As a group, farmers are the largest users of motor trucks in the country. In conjunction with other important labor-saving farm equipment, motor trucks have played a prominent role in placing the American farmer in the forefront as an efficient, low-cost producer.

SAE Announces Program of Public Utility Meeting

How post-depression motorized equipment problems are being solved will be explained by J. G. Holtzclaw, president of the Virginia Electric & Power Co., at the Regional Public Utility Meeting sponsored by the Society of Automotive Engineers in Baltimore, April 15 and 16. Automotive equipment will undoubtedly play an important part in the $410,000,000 rural electrification program expected to result from authorized Federal appropriations to be allocated to farmers through the Rural Electrification Administration during the next nine years.

A. W. Morton, Koppers Co., American hammered piston ring division, toastmaster at the opening-day dinner, will introduce Mr. Holtzclaw and will also present John A. C. Warner, secretary and general manager of the SAE. R. C. Hall, Baltimore Transit Co., treasurer of the SAE Baltimore Section which is cooperating with the Society's Transportation and Maintenance Activity in sponsoring this meeting, will act as dinner chairman.

The program of the meeting follows:

Thursday, April 15

10:00 a.m.
Chairman, ADRIAN HUGHES

Oil Filters in Public Utility Fleet Operation—PROF. J. L. CLOWER, Virginia Polytechnic Institute.

2:00 p.m.
Chairman, A. H. BISHOP

Utility Trucks, Cabs, Bodies and Auxiliary Equipment—T. C. SMITH, American Tel. & Tel. Co.

"Utilities" Dinner

6:30 p.m.
Dinner Chairman, R. C. HALL
Toastmaster, A. W. MORTON
Koppers Co. American Hammered Piston Ring Div.

As the SAE Advances—JOHN A. C. WARNER, Society of Automotive Engineers.

How the SAE Can Be Helpful to the Public Utility Operators—J. G. HOLTZCLAW, Virginia Electric & Power Co. and Edison Electric Institute.

Friday, April 16

10:00 a.m.
Chairman, W. H. BECK

Executive Control of Public Utility Fleet Operations—F. B. FLAHIVE, Columbia Gas & Electric Co.

Single Property Fleet Supervision—W. R. POLLARD, Georgia Power Co.

Safety Luncheon

12:30 p.m. Assembly Room
Tickets $1 per plate (no advance sales)
Chairman, J. R. SHERWOOD

A Study of the Safe Driver—J. W. LORD, Atlantic Refining Co.

2:30 p.m.
Chairman, L. W. SHANK
Economy Symposium—Ten-minute topics

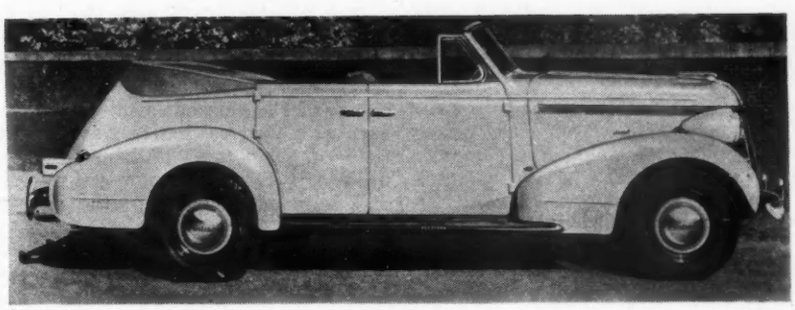
(a) Throttle Stops—O. A. AXELSON, Columbia Gas & Electric Co.
(b) Results in Non-changing Motor Oil—E. W. JAHN, Consolidated Gas, Electric Light & Power Co.
(c) Pooling of Passenger Car Equipment; and Night Maintenance—J. Y. RAY, Virginia Electric & Power Co.
(d) Pole-Trailer Brakes—DANIEL DURIE, West Penn. Power Co.
(e) Service and Maintenance Practice in Utility Fleets—C. D. PEEBLES, Carolina Power & Electric Co.

Public Utility Fleet Supervisors' Conference

5:00 p.m.
Chairman, J. Y. RAY
Virginia Electric & Power Co.
Vice-Chairman, E. W. JAHN
Consolidated Gas, Electric Light & Power Co.
Secretary, RANDOLPH WHITFIELD
Georgia Power Co.

Los Angeles Truck Show

The Automotive Council of Los Angeles, a fleet operators' organization, will hold its annual truck and trailer show April 24-25 at the Edison Transportation Yard in that city.



Anticipating an increasing vogue for sport cars, Pontiac Motors has begun production of the new 4-door convertible sedan shown above.

First Two Months' Sales Gain 26%

New Passenger Car Registrations

	February 1937	January 1937	February 1936	Two Months 1937	Two Months 1936	Per Cent Change 2 Months 1937 over 1936	Per Cent of Total Two Months 1937	Per Cent of Total Two Months 1936	Four Months 1937 Models	Four Months 1936 Models	Per Cent Change Four Months
Ford	61,805	67,166	43,724	128,971	94,468	+ 36.3	26.02	24.07	220,032	205,640	+ 7.2
Chevrolet	29,646	56,122	53,310	85,768	116,302	− 26.3	17.31	29.64	229,414	237,490	− 3.4
Plymouth	39,590	43,420	23,577	83,010	53,499	+ 55.1	16.75	13.63	172,413	116,351	+ 48.1
Dodge	20,863	21,963	11,105	42,826	26,345	+ 62.8	8.64	6.71	85,064	59,221	+ 43.6
Pontiac	8,733	16,189	7,848	24,922	17,225	+ 44.5	5.03	4.39	57,021	39,645	+ 44.0
Oldsmobile	6,791	15,193	9,383	21,984	20,915	+ 9.3	4.44	5.33	46,302	48,483	− 4.5
Buick	6,120	15,205	6,651	21,325	15,820	+ 34.9	4.30	4.03	59,010	40,723	+ 45.0
Terraplane	6,181	7,019	3,727	13,200	8,388	+ 57.7	2.66	2.14	26,778	18,387	+ 45.6
Packard	6,587	6,562	2,424	13,149	5,454	+141.0	2.65	1.39	27,641	14,107	+ 95.6
Chrysler	5,921	6,543	2,785	12,464	6,451	+ 93.0	2.51	1.64	24,785	11,131	+123.0
De Soto	4,927	5,073	1,763	10,000	4,088	+144.5	2.02	1.04	19,165	7,847	+144.0
Studebaker	4,702	4,923	3,199	9,625	7,142	+ 35.0	1.94	1.82	21,928	13,108	+ 67.3
Nash	4,209	4,581	1,839	8,790	4,434	+ 98.3	1.77	1.13	17,192	9,708	+ 77.1
Willys	3,339	2,573	781	5,912	1,488	+298.0	1.19	.38	7,594	3,699	+105.0
Lincoln	1,700	1,774	699	3,474	1,500	+131.0	.70	.38	7,237	2,472	+193.0
La Salle	884	2,224	568	3,108	1,282	+142.0	.63	.33	7,580	3,474	+118.0
Hudson	1,208	1,527	1,236	2,735	2,988	− 8.5	.55	.76	6,101	7,156	− 14.6
Graham	901	967	798	1,868	1,690	+ 10.5	.38	.43	4,406	3,522	+ 25.0
Cadillac	585	1,151	637	1,716	1,493	+ 15.0	.35	.38	4,069	3,678	+ 10.6
Cord	88	97	7	185	7	...	.04	...	323	7	...
Auburn	42	40	175	82	376	− 78.2	.02	.10	217	884	− 75.4
Pierce-Arrow	32	38	48	70	104	− 31.3	.01	.03	170	256	− 33.6
Miscellaneous	139	265	387	404	967	− 58.3	.09	.25	2,009	2,917	− 31.4
Total	214,973	280,615	176,651	495,588	392,426	+ 26.3	100.00	100.000	1,046,451	849,906	+ 23.0
Chrysler Motors	71,301	76,999	39,230	148,300	90,383	+ 64.2	29.92	23.03	301,427	194,550	+ 54.8
Ford and Lincoln	63,505	68,940	44,423	132,445	95,968	+ 38.0	26.72	24.46	227,269	208,112	+ 9.1
General Motors	52,739	106,084	78,377	158,823	173,037	− 8.2	32.05	44.09	403,396	373,493	+ 8.0
All Others	27,426	28,592	14,621	56,020	33,038	+ 69.8	11.31	8.42	114,359	73,751	+ 55.0

Operations Speeded Up

(*Continued from page* 543)

mark. On the basis of the AMA report that members last month built 350,000 vehicles, the industry as a whole should show in the neighborhood of 515,000 units when official figures become available. This compares with 383,637 units in February and 438,992 in March last year. It brings the first quarter's total to 1,298,063 units as against 1,117,172 in the corresponding period of 1936.

A further sharp gain in retail sales is disclosed in figures for the last reporting period in March, although strike-bound companies had begun to feel the effects of depleted dealers' stocks. New all-time records for retail deliveries were set by some of the others, and even companies having uninterrupted production through March were having difficulty meeting the requirements of dealers.

Cadillac-La Salle's retail business in March was 30 per cent greater than the previous all-time high. Dealers delivered 4902 cars compared with the former March record of 3775 in 1928. March volume was more than double that of a year ago.

Buick's domestic retail deliveries in March totaled 20,951 units compared with 15,107 in March a year ago, a gain of 5844 cars or 38.6 per cent. Deliveries during the last 10 days of the month were 8677 units, compared with 6856 in the previous 10 days and 7238 in the corresponding 1936 period. March output of 26,473 cars, which includes export but not shipments to Canada, averaged better than 1150 a day. Retail orders in the hands of dealers at the beginning of the month were 19,488 against 4207 a year ago. Buick entered April with a bank of 36,323 wholesale orders against 10,186 in the corresponding 1936 period.

Retail sales of Lincoln Zephyr cars in March were the highest for any month since their introduction in October, 1935, totaling 3026 units, an increase of 120 per cent over March, 1936. Stocks in dealers' hands were reported reduced. The total of Lincoln Zephyr dealers in the U. S. now exceeds 1500 and is steadily growing, the company reports.

Studebaker had the best March and the best first quarter business in eight years, according to the sales figures released this week. The sale of 10,634 passenger cars and trucks in March is reported, compared with 8970 in March, 1936. This brought sales for the quarter to 26,338 compared with 21,202 in 1936—an increase of 24 per cent.

With production of 9395 Willys cars in March, a satisfying gain over February output, Willys-Overland Motors, Inc., reported the third consecutive monthly gain since production of the new models began on Dec. 1. In the four months' period total output was 28,602 units.

Pontiac March retail deliveries set an all-time record with a total of 25,609 against 23,750 the previous peak in April, 1929. This compares with 8332 in February this year and 17,589 in March, 1936. First quarter deliveries totaled 47,544 against 34,361 a year ago.

New Truck Registrations

	February 1937	January 1937	February 1936	Two Months 1937	Two Months 1936	Per Cent Change 2 months 1937 over 1936	Per Cent of Total Two Months 1937	Per Cent of Total Two Months 1936
Ford	16,460	16,544	12,226	33,004	26,832	+ 23.1	36.91	31.92
Chevrolet	7,939	14,362	14,978	22,301	30,102	− 26.7	24.94	35.81
International	5,256	6,244	4,365	11,500	9,108	+ 26.5	12.86	10.83
Dodge	5,043	3,764	5,556	8,807	11,763	− 25.1	9.85	13.99
G. M. C.	3,051	2,820	758	5,871	1,186	+396.0	6.58	1.41
Plymouth	714	216	188	930	381	+144.0	1.04	.45
Diamond T	602	863	510	1,465	1,005	+ 46.5	1.63	1.20
White	367	479	293	846	702	+ 20.6	.95	.84
Mack	384	389	107	753	197	+282.0	.84	.23
Terraplane	381	285	94	646	153	+322.0	.72	.18
Reo	317	354	217	671	556	+ 20.7	.75	.66
Studebaker	222	169	134	391	277	+ 41.0	.44	.33
Federal	206	207	170	413	393	+ 5.0	.46	.47
Indiana	183	113	115	296	199	+ 48.9	.33	.24
Brockway	115	102	88	217	182	+ 19.1	.24	.22
Autocar	112	130	57	242	132	+ 83.3	.27	.16
Stewart	101	92	62	193	147	+ 31.2	.22	.17
Divco	94	80	33	174	86	+102.0	.19	.10
Willys-Overland	57	125	142	182	320	− 43.1	.20	.38
F. W. D.	48	42	37	90	56	+ 60.8	.10	.07
Stutz Pak-Age Car	41	72	...	113	...	....	.13	..
Sterling	26	29	4	55	12	+348.0	.06	.02
Schacht	4	6	...	10	...	....	.01	..
Kenworth	3	8	...	11	...	....	.01	..
Miscellaneous	129	114	167	243	272	− 10.6	.28	.32
Total	41,815	47,609	40,301	89,424	84,061	+ 6.2	100.00	100.00

Ask Place on Reo Board

Vanderlip Heads Stockholder Group Seeking Share of Control

Purchase by Frank A. Vanderlip and an affiliated group of an interest in the Reo Motor Car Co. was confirmed by Mr. Vanderlip's son this week. The group has asked for representation on the board of directors. Mr. Vanderlip, Jr., denied flatly that there is any foundation for reports that the Reo company will be combined with the Auburn Automobile Co. in which Mr. Vanderlip for a long time had a major interest.

Prospects for a proxy fight at the annual meeting scheduled for April 20 were discounted by Mr. Vanderlip who said the group's requests have been very reasonable. The group has, however, asked certain large holders of stock for support at the meeting.

Donald Bates, president of Reo, was quoted as saying that he knew of no dispute between recent purchasers of stock and the management.

There was no indication of the Vanderlip plans. Some observers thought it probable that Mr. Vanderlip would seek to reconstruct the company's business. The company has recently abandoned the passenger car business and is concentrating on truck production. It is one of the oldest motor car companies in the country.

The independent stockholders' committee, seeking a share in the control of the Reo Motor Car Co., has filed with the Securities and Exchange Commission a copy of the letter sent by it to stockholders in connection with the solicitation of proxies for the annual meeting April 20. The letter said the several committee members own 500 shares of stock. Should it succeed in getting a majority of directors on the board, it will enlarge the board and add men of experience and connections who can aid the company, the letter said.

Ford's "Universal Rhythm" Goes to Columbia Network

"Universal Rhythm," starring Richard Bonelli, Alex Templeton, the Landt Trio and Curly Mahr, and Rex Chandler's Orchestra, comes to the nationwide Columbia network April 17 under the sponsorship of the Ford dealers of America. It will be heard every Saturday thereafter from 7:30 to 8:00 p.m., E.S.T. "Al Pearce and His Gang," second Ford Dealers' program, and the "Ford Sunday Evening Hour," institutional, will continue on CBS at the usual time.

Herrick Lycoming President

E. D. Herrick, formerly chief engineer of the Lycoming Manufacturing Co., and long associated with that company, has been elected president. At the same time directors announced the election of C. N. Tull as vice-president of Lycoming in charge of the Spencer Heater division. Other officers named at the annual meeting are as follows: H. D. Stuempfle, treasurer; J. Alan Smead, assistant treasurer, and R. S. Pruitt, secretary. Directors are: R. H Faulkner, H. T. Ames, E. D. Herrick, Seth T. McCormick, Jr., C. N. Tull and R. S. Pruitt.

7000 Back to Work in Toledo

Nearly 7000 Toledo workers were recalled to jobs at Electric Auto-Lite, Logan Gear, and City Auto Stamping plants here as a result of settlement of the Chrysler strike.

It is expected that operations will not get under way to any extent until Monday and it may require more than a week to get workers back at the Auto-Lite. Some other plants were affected to lesser extent.

New York Buys 75 Autocars

Seventy-five heavy duty Autocar trucks have been purchased by the Department of Sanitation of the City of New York. These trucks will be equipped with 2500 gal. streamline flusher tanks and will be used for flushing the streets of the city.

:SLANTS:

ANTIQUES—*Tire men are used to getting all sorts of requests for adjustments—but just read this one, recently received from England by the B. F. Goodrich Co.: "I am in trouble with some of your tyres. They leak gradually and not through the valve. They are rather old, being single tube tyres of* 1900 *date of manufacture. They are on a Locomobile steam car that I am overhauling for a famous collector. He is very keen on using the same tyres on the few runs that are made every year to show how motoring used to be. Have you any useful ideas on how to treat these internally to cure their porosity? The treads are supple and as good as new as far as I can tell." And even stranger than this request is the fact that Goodrich is sending to England a special compound developed by its technical men for just such a purpose, which, it is hoped, will preserve the tires for several more years.*

345 TAXES—*The burden of 345 taxes fall on the operation of a motor vehicle, said Congressman Fred A. Hartley, of New Jersey, in a recent talk. The average motorist, he said, does not realize that "there are 27 taxes on the purchase of a car, 117 on its upkeep, and 201 on the oil and gasoline." These burdens, Mr. Hartley added, fall heaviest on persons with small or moderate incomes.*

100,000,000 "FORDS"—*Production of Ford cars in Japan is now running at the rate of over 100,000,000 a year, it is reported, with most of the output being exported to the United States. These Japanese "Fords," it should be added, are toy cars. The quick, skillful fingers of Japanese girls put the tiny cars together, aided by a conveyer system much like those in Detroit, but with cars coming off the lines a dozen at a time.*

NASH BOWLERS—*Twenty-seven hundred and fifty Nash Motors employes have begun what is believed to be the biggest industrial bowling tournament ever held. A total of* 550 *teams from the Nash factories and offices at Kenosha, Racine and Milwaukee have entered the tournament. The first game will see officials of the company, headed by George W. Mason, president of Nash Kelvinator, and C. H. Bliss, vice-president of sales of the Nash Motors division, taking the first shot at the pins.*

FREE GAS—*When the Culpepper Motor Co., Pontiac dealer in Elizabeth City, N. C., finds its used car stock getting a little top-heavy, a barrel of gas is given to each used car purchaser until the stock is brought back to normal. Circulars are printed declaring that a barrel of gasoline will be given away to used car buyers during a certain period. Any filling station operator who brings in a prospect gets the order for the gasoline. A barrel of gas sounds like a lot of gas, but* 50 *gal. at* 20 *cents is only* $10, *and* $10 *is cheap to move certain used cars.*

Many Support NADA Stand

A wave of support of the stand taken to outlaw effectively the seizure and holding illegally of private property, such as the current vogue of sit-down strikes, as pronounced recently by the National Automobile Dealers Association, is being received daily at the NADA headquarters in Detroit, A. N. Benson, general manager, said this week.

AMA Sales Gain 41%

350,078 Units Highest March Volume Since 1929

Factory sales by members of the Automobile Manufacturers Association amounted to 350,078 cars and trucks in March, the association reports.

This was the highest March volume for association members since 1929, exceeding the shipments for March of last year by 7 per cent. March factory sales were 41 per cent higher than those of the preceding month.

On the basis of the association's report, sales during the first quarter amounted to 863,802 units—an increase of 5 per cent over the corresponding period of last year.

The association's report, which covers the operations of all but one of the major producers of motor vehicles in the United States, is summarized below:

March, 1937	350,078
February, 1937	247,901
March, 1936	327,040
3 months, 1937	863,802
3 months, 1936	824,077

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

General business continued active last week, with gains in some directions, despite several unsettling influences. These included the break in the government bond market, the threat of a strike in the bituminous coal industry, and the unsettled strike in automobile plants, together with new sitdowns in the same industry.

Carloadings Remain Steady

A further slight gain in the movement of railway freight was reported for the week ended March 27. Loadings during that period totaled 761,109 cars, showing a gain of 1840 cars, or 0.24 per cent, above the figure for the preceding week, and a rise of 166,320 cars, or 27.96 per cent, above that for the corresponding period last year. The 13 Shippers' Regional Advisory Boards estimate that car loadings in the second quarter will be about 7.5 per cent above actual loadings in the similar period of 1936.

Power Gains 18%

Production of electricity by the electric light and power industry of the United States for the week ended March 27 was 18.1 per cent greater than in the corresponding period last year. This compares with a gain of 16.3 per cent above last year's figure reported a week earlier, one of 16.9 per cent two weeks earlier, and one of 15.6 per cent three weeks earlier.

Seven-Year High for Farm Prices

The general level of farm prices at the middle of March was the highest for that month in seven years, according to the Bureau of Agricultural Economics, United States Department of Agriculture. The index of the bureau for March 15 stands at 128, as against 127 on Feb. 15 and 104 a year ago. The current figure is, however, below the post-depression peak of 131 reported two months ago.

Crude Output Above Limit

Average daily crude oil production for the week ended March 27 was 3,431,300 bbl., showing a decline of 16,850 bbl. from the figure for the preceding week. The total a year ago was 2,876,200 bbl. The current figure is still considerably above the 3,159,000 bbl. calculated by the United States Department of the Interior to be the total of the restrictions imposed by the various oil-producing States during March.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for last week stands at 94.7, as against 94.4 the week before, 93.7 two weeks before, 92.9 three weeks before, and 91.1 four weeks before.

Federal Reserve Statement

Bills discounted by the Federal Reserve banks increased $4,000,000 during the week ended March 31; but this gain was more than offset by declines in industrial advances and other Reserve bank credit, resulting in a decrease of $5,000,000 in total Reserve bank credit. The gold stock increased $33,000,000, member bank reserve balances $61,000,000, money in circulation $2,000,000, Treasury cash $29,000,000, and Treasury deposits with the Federal Reserve banks $32,000,000, while non-member deposits and other Federal Reserve accounts declined $92,000,000.

Notes from Nippon

Many Car Factories Plan Expansion; Tool Orders for U. S. Firms

A new automobile manufacturing company, intended to rival the Nissan Jidosha ("Datsun") enterprise, will be established in Japan this month through the merging of the Tokyo Gasudenki and the Jidosha Kogyo companies, which already have a joint sales organization known as the Kokusan Jidosha Kogyo Co. The Tokyo Gasudenki, of which Goro Matsukata is president, is capitalized at 6,000,000 yen, and the Jidosha Kogyo, headed by Tomonosuke Kano, is capitalized at 6,500,000 yen.

The new concern plans to manufacture more than 3000 cars a year. The new company will specialize in medium-priced cars, as distinct from the "cars for the masses" made by Toyota and Nissan.

Nissan Jidosha is now building a new factory at Koyasu, near Yokohama, in which will be installed the equipment bought from Graham-Paige last year. The new cars are expected to be in production in May. A loan involving 7,000,000 yen has been concluded between Nissan and the Bank of Japan, the Yasuda Bank and the Mitsui Trust Co. At the same time the company has decided to increase its fully paid-up capital to 30,000,000 yen.

The "Datsun" baby car chassis has proved successful as a light delivery truck. The Nissan Jidosha has decided, therefore, to organize a separate sales organization for these vehicles, which have already eclipsed the sales of passenger models. Its capitalization is 5,000,000 yen, fully paid up.

To prevent underrating of import values in invoices for the purpose of duty evasion, the Japanese Finance Minister, Toyotaro Yuki, has decided to levy a specific duty on automobile parts instead of an ad valorem duty. Standard parts for popular-priced cars are expected to be hit worse by this decision.

The General Motors Corp. of Japan has announced four types of Chevrolet trucks powered with Hercules Six Diesel engines.

The Ford Motor Co. of Japan has created a special department for testing and purchasing Japan-made parts. In the past, locally produced parts had to be sent to Detroit for testing.

Following the surrender of the controlling interest in the Dunlop Far East Rubber Co. to the Japanese Okura group in February, all tire companies established by foreign interests in Japan are now controlled by Japanese.

The Japan Iron Works has placed orders with two American firms for the erection of a hot strip mill which will produce 450,000 tons of steel sheets annually. One-third of the total cost of 15,000,000 yen will be spent in Japan, and 10,000,000 yen will go to the United Engineering & Foundry Co. and the Mesta Machine Co. of the U. S. The plant will be practically a duplicate of the strip mill built for the Carnegie-Illinois Steel Co. in 1935.

The Toyota Automobile Co. plans to retool its Kariya plant at a total outlay of 4,000,000 yen. American tool makers are named as most likely to get the orders. When the extension is completed, the company will have a capacity of 12,000 passenger cars annually.

The Hitachi Works, Ltd., is also inviting bids for additional equipment for its Diesel engine plant in Ibaraki prefecture.

New Diesel Injection Pump to Be Produced

F. M. Davis and J. S. Franco have developed an injection pump for Diesel engines which will be manufactured by the Davis & Thompson Co., of Milwaukee. It is to be made in units for two, four, and six-cylinder engines of from 5 to 50 hp. per cylinder. Installation can be made on any engine having standard injector or magneto pads.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

Improvements in Gas Engines

At a recent meeting of the society of German engineers, Herr Petréano gave an account of his improvements in gas engines, by means of which a practically instantaneous explosion is obtained.

The apparatus of Herr Petréano provides for the mixture of the air and gas before they enter the cylinder, and consists of a cylindrical chamber through which passes longitudinally a central tube; through this tube the exhaust gases pass, thus heating it to a high temperature. The tube is covered with a wicking of asbestos fiber and a series of diaphragms are fitted in the annular space between the outside of the central tube and the inside of the chamber. The incoming gas and air pass through this mixing and heating chamber and are thus thoroughly diffused before they enter the cylinder for compression. The result, as shown by indicator diagrams, is a greatly-increased rapidity of combustion and an increase, not only in the initial, but also in the mean effective pressure.

From *The Horseless Age*, April, 1897.

Automotive Metal Markets

Automotive Takings of Steel Fall to 16% of Capacity, but Mills Regard Low Ratio as Only Temporary

By William Crawford Hirsch

Rosy as is the picture of the steel industry with reference to orders on the books of most mills for the general run of heavy steel products, the dent made by strikes in the flow of shipments into automotive consumption causes many steel producers to wonder whether or not this will be made up this year by automotive demand continuing beyond the time when it usually tapers off.

Some of the flat steel producers look for heavier billings to automobile manufacturers and parts makers in May and June than is normally the case in these months. Basing their figures on the weekly reports of automobile assemblies some of the steel industry's statisticians allege that in the last week or two a smaller percentage of the entire steel output has been going into automotive consumption than at any time since automobile manufacturing forged to the front as the steel industry's best customer. They estimate current takings at 16 per cent of the total steel production, as compared with the 1936 record of better than 20 per cent.

This state of affairs is looked upon as nothing more than transitory, the return of more orderly conditions in assembly and parts manufacturing plants being expected to restore a higher rate of steel shipments in short order; and unceasing efforts are being made to raise the capacity of mills that cater chiefly to automotive consumers. An alloy steel specialist is adding another electric melting furnace and kindred plant extensions and improvements are planned by other mills. It is to competition, resulting from enlarged and more economical production facilities, that consumers look for relief from the specter of further price advances in the steel market; and pontificial pronouncements from Washington that prices for steel and other metals are too high in no wise lighten their burden.

Pig Iron—Some of the automotive castings manufacturers who, as the result of strikes, could not take all of their first quarter purchases, will be given the opportunity to do so without having to pay higher prices. The movement of iron to foundries continues brisk, the market ruling strong at full prices.

Aluminum—According to one aluminum specialist, demand for metal for aluminum forgings for hydraulic brakes is on the uptrend. The same authority predicts a sharp increase in aluminum demand next year as the result of transmission refinements that will have been perfected by then. While aluminum, along with most other metals, has been in abnormal demand in Europe for armaments, prices have been generally kept on a fairly even keel. The market here for both primary and secondary metal is firm and unchanged.

Copper—Producers of electrolytic reduced their price on Tuesday by one cent a pound to 16 cents, the first recession since the price rise which started in the summer of 1935, when copper was selling at eight cents. At the same time one of the country's leading metal interests came out with a denunciation of the tariff on copper and asked that, in the interest of the small consumer, it be speedily abolished.

Tin—The Straits market has turned dull and easy, opening on Monday with spot metal quoted at 62⅝ cents, but on Tuesday there were sellers at 62 cents and bids of 61¾ cents came in for attention. Dutch East Indies producers are adding batteries of new dredges and a large smelter in Holland is installing a new furnace, increased production being looked to as the sound way of bringing down prices.

Lead—A $1 per ton reduction late last week failed to act as a stimulant for demand. The market is quiet with one producer quoting 6.90 and another 7.05 cents, New York, at the beginning of the week.

Zinc—Steady and unchanged.

Labor Troubles, Revaluation Boost Prices of French Cars

Automobile prices in France have recently advanced considerably, first, because of the devaluation of the French franc and second, on account of social legislation, strikes and other economic disturbances. A recent publication lists prices in three parallel columns, the first column giving the prices printed in the annual *Autocatalogue* for 1936, the second the prices in the *Autocatalogue* for 1937, and the third column the most recent prices. Comparing the 1936 *Autocatalogue* with the latest prices, those of Renault cars increased an average of 16.5 per cent, those of Peugeot models, 10 per cent; Panhard, 14.5 per cent; Citroen, seven per cent, and Delahaye, 35 per cent.

Federal Truck Adds Heavy Duty Models

The Federal Motor Truck Co. has added to its truck line what is referred to as the H-series of oversize models, six of which parallel the company's line of conventional and four its cab-over-engine trucks. These trucks differ from the standard models in having heavier rear axles, rear springs, rear brakes, universal joints and tire equipment. The line is intended chiefly for dump work and for use with trailers in hilly sections.

Chrysler Adds to Canadian Plant

Another factory addition will be erected by the Chrysler Corp. of Canada, Ltd., Windsor, Ont., at an estimated cost of $150,000.

February Exports Near $26,000,000

	FEBRUARY 1937		FEBRUARY 1936		TWO MONTHS ENDED FEBRUARY 1937		TWO MONTHS ENDED FEBRUARY 1936	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 25,974,213		$ 22,142,805		$ 535,606,612		$ 44,225,716
PASSENGER CARS								
Passenger cars and chassis	16,901	10,423,387	15,944	9,270,425	36,845	22,016,674	31,723	18,166,862
Low price range $850 inclusive	15,312	8,713,918	14,366	7,561,863	33,492	18,375,044	29,095	15,237,459
Medium price range over $850 to $1,200	1,340	1,263,516	1,348	1,294,186	2,785	2,628,338	2,166	2,078,841
$1,200 to $2,000	181	275,885	154	223,383	431	669,037	297	429,112
Over $2,000	68	170,068	76	190,993	137	344,255	165	421,450
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total)	10,482	5,991,091	9,897	4,913,997	23,049	12,068,916	19,653	9,781,658
Under one ton	1,183	467,895	1,242	425,603	2,715	1,032,798	2,912	1,028,996
One and up to 1½ tons	7,386	3,540,290	6,654	3,015,040	17,158	7,790,283	13,362	6,108,086
Over 1½ tons to 2½ tons	1,363	1,118,967	1,238	911,260	2,277	1,635,985	2,396	1,724,275
Over 2½ tons	410	763,929	386	423,076	656	1,255,721	587	755,389
Bus chassis	140	100,010	377	139,018	243	174,129	396	164,912
PARTS, ETC.								
Parts except engines and tires		5,267,735		4,404,542		10,897,375		9,531,804
Automobile unit assemblies		2,597,553		1,963,393		5,107,178		3,910,992
Automobile parts for replacement (n. e. s.)		470,478		345,873		1,192,998		763,281
Automobile service appliances		1,218,940		475,840		2,632,411		1,031,861
Airplanes, seaplanes and other aircraft	38	468,995	33	376,411	82	1,077,382	57	678,011
Parts of airplanes, except engines and tires								
INTERNAL COMBUSTION ENGINES								
Stationary and Portable								
Diesel and semi-Diesel	65	167,267	19	114,762	124	294,788	71	300,560
Other stationary and portable								
Not over 10 hp.	1,789	79,492	714	50,438	3,062	159,147	1,499	106,916
Over 10 hp.	210	130,284	269	65,319	332	206,245	449	159,569
Automobile engines for:								
Motor trucks and buses	3,096	302,841	3,649	341,440	5,939	595,414	5,951	557,106
Passenger cars	9,800	645,278	5,964	450,009	18,675	1,255,135	10,763	767,570
Engines and aircraft	108	747,611	37	137,743	151	937,881	83	340,538
Accessories and parts (carburetors)		195,742		174,260		381,712		309,473
IMPORTS								
Automobile and chassis (dutiable)	145	83,897	54	28,496	247	154,470	109	47,025

Letters

to AUTOMOTIVE INDUSTRIES

Brakes and Safety

Mr. Oldfield's article in your Jan. 23 issue, entitled "Newer Cars Offer More Hazards," is a most excellent and courageous one and is just what the automotive industry needs for its own good. He backs up my contention that brake development has lagged behind to such an extent that the new cars are unsafe when braked at high speeds or under unfavorable conditions.

Mr. Oldfield states that: "No car with half or more of the weight on the front wheels when car is at rest can be expected to respond to directional control under emergency braking"; and, "The only way in which steering control can be retained . . . is to deliberately restrict the braking ability of the front brakes . . ."

Mr. Oldfield has probably never driven a car with torque or road equalized brakes, where the equalization is effected at the road surface and not on the drums. The automobile industry started off on the wrong foot when it followed railway brake practice and used pressure equalization. Railway car braking and automobile braking are different problems and cannot be solved by the same formula.

H. E. Maynard, in his article in the SAE Journal, of September, 1925, hits the nail on the head when he states:

"It is admitted by all, I believe, that the satisfactory performance of brakes, whether applied on two or all four wheels of a car, requires equalized pressure to the brake bands at least. Equalized braking-effort, the ideal to be sought, is what we attempt to attain, of course, but variation in the co-efficient of friction between the brake lining and the brake drums and also between the tires and the road complicates the problem to such an extent that, for the present, at least, we content ourselves with pressure at the brake bands that is as nearly equalized as possible."

That was over 11 years ago and the automobile industry is still "content" to use pressure equalization, when what is needed is pressure unequalization to produce a balance of right and left braking forces when brake lining friction or tire-to-road friction, or both, are not equal on the two sides. People are being killed almost daily as a result of improperly equalized brake systems, yet the industry and the public do nothing about it. If he had been using road-equalized brakes, Mr. Duzenberg would probably be alive today, also Mr. Vail, of Chicago, and many others who might be mentioned.

All of Mr. Oldfield's criticisms above quoted are built around the shortcomings of present brakes, and unless the "numerous experimental examples of really safe cars" of which he speaks, are equipped with road equalized brakes, then they are not as safe as they can be made. With brakes torque equalized the distribution of weight may be anything the designer wishes so long as the ratio of brake power to weight supported is a little less in front than in the rear. On curves centrifugal force loads up the outer wheels and keeps them from locking. Torque equalization improved the steering action of old cars with vertical off-set king pins, a design of front end that had to be abandoned to make possible the use of pressure equalized brakes. Torque equalized brakes stay in balance regardless of temporary or permanent changes in brake or road friction.

G. L. Smith.

Calendar of Coming Events

SHOWS

Yugoslavia, 14th Automobile Salon, Zagreb .....April 17-26
Illinois Automotive Ass'n, 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago .....Apr. 24-28
Poland, Automobile Salon—16th International Fair, Poznan .....May 1-10
Norway, Automobile Salon—Oslo.May 7-10.
Second Annual Automobile Maintenance Show, San Francisco..May 20-23
Morocco, Automobile Section, Tangier Fair, Tangier .....June
France, Automobile Section, Bordeaux Fair, Bordeaux .....June 13-28
Belgium, First International Aeronautical Salon, Brussels ...June 18-30
Fourth ASTM Exhibit of Testing Apparatus and Related Equipment, New York .....June 28-July 2
Poland, Automobile Salon (Foire Orientale), Lwow .....Sept. 1-15
France, 31st International Automobile Salon, Paris .....Oct. 7-17
Great Britain, 31st International Automobile Exposition, London...Oct. 14-23

Show Business

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N.Y.C. Inquiries concerning all matters connected with the national show should be addressed to him. AUTOMOTIVE INDUSTRIES will be pleased to furnish names and addresses of local show managers on request.

National Automobile Show, New York, Oct. 27-Nov. 3
Italy, 10th International Automobile Salon, Milan .....Oct. 28-Nov. 8
Buffalo, N. Y., Automobile Show, Oct. 30-Nov. 6
Cincinnati Automobile Show .Oct. 31-Nov. 6
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London..Nov. 4-13
Chicago Automobile Show .....Nov. 6-13
Akron Automobile Show .....Nov. 6-12
Omaha Automobile Show.....Nov. 6-11
Brooklyn Automobile Show .....Nov. 6-13
Columbus Automobile Show .....Nov. 6-13
Detroit Automobile Show .....Nov. 6-13
Kansas City, Mo., Automobile Show, Nov. 6-13
Motor Truck Show, 4th Annual, Newark, N. J. .....Nov. 6-12
Newark, N. J., Automobile Show, Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13
Pittsburgh, Pa., Automobile Show.Nov. 6-13
Toronto, Ont., Automobile Show..Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow .....Nov. 12-20
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Jersey City, N. J., Automobile Show, Nov. 13-20
Milwaukee, Wis., Automobile Show, Nov. 13-20
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show, Nov. 14-21

CONVENTIONS AND MEETINGS

S.A.E. Regional Transportation and Maintenance Public Utility Meeting, Baltimore, Md.....April 15-16
International Association for Testing Materials, Second International Congress, London, England.April 19-24
S.A.E. National Tractor and Industrial Power Meeting, Peoria, Ill..April 21-23
U. S. Chamber of Commerce, 25th Annual Meeting, Washington, D. C., April 27-29
National Machine Tool Builders' Association, Spring Convention, Edgewater Beach Hotel, Chicago....May 3-4
41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee .....May 3-7
S.A.E. Summer Meeting, White Sulphur Springs, W. Va. .....May 4-9
National Battery Manufacturers Asso., Spring Convention, Shoreham Hotel, Washington, D. C....May 13-14
American Society of Mechanical Engineers, spring convention, Detroit, May 17-21
National Association of Purchasing Agents, 22nd Annual Convention, William Penn Hotel, Pittsburgh, Pa. .....May 24-27
American Petroleum Institute, Mid-Year Meeting, Colorado Springs, Colo. .....June 1-3
Second World Petroleum Congress, Paris, France...late May—early June
Automotive Engine Rebuilders Association, 15th Annual Convention, Chicago .....June 21-24
American Society for Testing Materials, 40th Annual Meeting, New York, June 28-July 2
American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va. .....Sept. 19-23
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif....Oct. 7-9
S.A.E. Annual Dinner, Commodore Hotel, New York .....Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago .....Nov. 9-12
SAE National Production Meeting, Flint, Mich. .....Dec. 8-10

CONTESTS

Indianapolis Speedway, 500-Mile International Sweepstakes .....May 31
31st Annual Grand Prix of the Automobile Club of France, Linas-Montlhéry .....July 4
Pan American Cup Race, Roosevelt Raceway .....July 5
National and International Soap Box Derby Finals, Akron, Ohio .....Aug. 15
Roosevelt Raceway, 400-Mile George Vanderbilt Cup Sweepstakes...Sept. 6
Los Angeles, 500-Mile International Sweepstakes .....Nov. 28

"Building a Career in Arc Welding" is a beautifully illustrated booklet issued by the Lincoln Electric Co., Cleveland, which outlines the need for men of this rapidly growing industry. The training facilities of the Lincoln Welding School for both novices and veterans are described.*

The role of sales finance companies is described in "Instalment Finance," an article in the April, 1937, issue of "The Index," monthly publication of the New York Trust Co., 100 Broadway, New York, N. Y.

A handbook of 52 pages has been published by the Norton Co., Worcester, Mass., entitled, **"Grinding Cemented Carbide Tools."** The object of the booklet is to assist tool room operators in selecting the proper grinding wheels and in employing the correct methods for sharpening their cemented carbide tools in order to obtain the most efficient service.*

*Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Change in Scope of Two SAE Viscosity Numbers

Attention is directed by the Society of Automotive Engineers that changes have been made in the viscosity ranges covered by S.A.E. 40 and S.A.E. 50 viscosity numbers.

The maximum viscosity at 210 deg. F., for S.A.E. No. 40 has been changed from "less than 75" to read "less than 80," and the minimum viscosity at 210 deg. F., for S.A.E. No. 50 has likewise been changed from 75 to 80. This change became effective on Jan. 15, 1937.

Just Among Ourselves

Spirit of '76 in Modern Dress

IMPORTANT events this week moved the labor question rapidly toward the expression of its common denominator. The Senate resolution, the Chrysler truce, and Henry Ford's courageous declaration of policy, all helped to define the lines on which the dissentions of the next few months will be fought out.

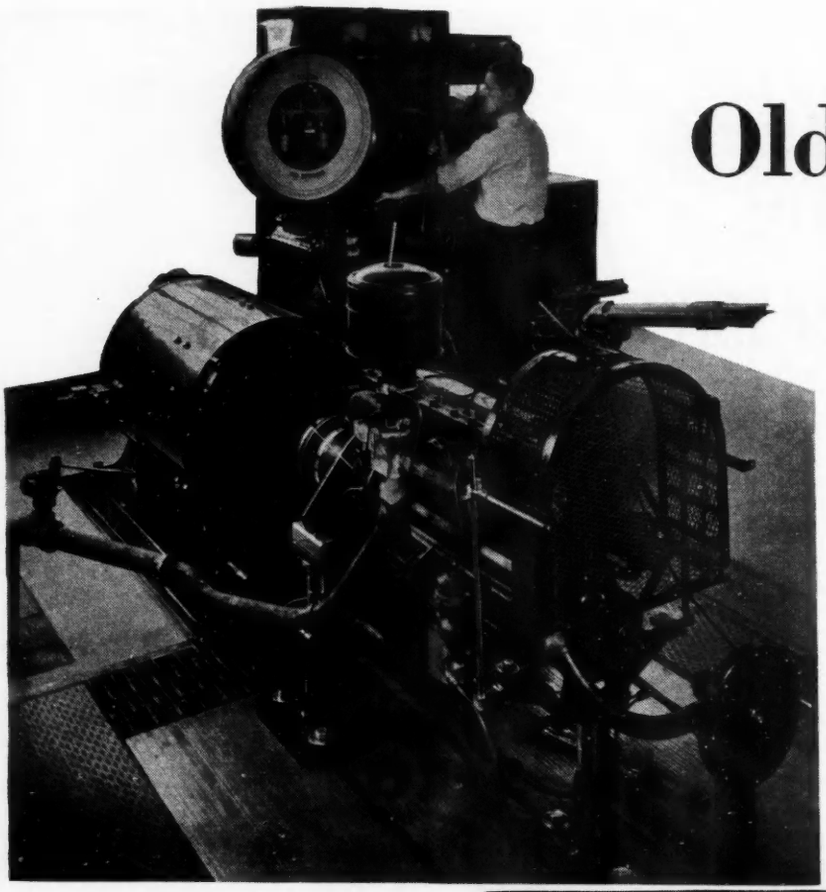
But the drama inherent in the automobile situation was overshadowed during the week by forcible ejection of sitdowners from the chocolate plant at Hershey, Pa. —because of the force and decisiveness with which it was organized, and the fact that it was a spontaneous expression of public opinion against the sitdown technique.

Peaceful settlement of labor strife is infinitely to be preferred to violent action. But when trespass is condoned by the elected representatives of the people, and such trespass by a minority violates the rights of a larger group, violence often breaks out. That, it must be remembered, whether one likes it or not, is part of the American tradition.

Historical research of the last two decades has established the fact that our revered declaration of Independence was almost lost by a "sitdown" of certain members of that early Philadelphia convention, who were afraid of losing business if the Colonies severed their connection with the British Crown. Some of these, the record shows, were pulled from their homes by force and dragged to the convention to pen reluctant signatures.

We hope the taste for violence has been diluted by the years. But we believe also, that the automotive industry, on a realistic basis, may owe to the citizens of Hershey a vote of thanks for having dramatized to the nation the power of the will to work.—H.H.

Olds Engineers



One of the group of dynamometer stands in the experimental department

EARLY last fall, just about the time of the 1937 Olds preview, the doors of the Olds Engineering Building were thrown open for public inspection. This event may be considered as the beginning of a new era in the rich history of Oldsmobile since it offers not only complete and centralized research facilities but provides a positive stimulus to advanced thinking and planning.

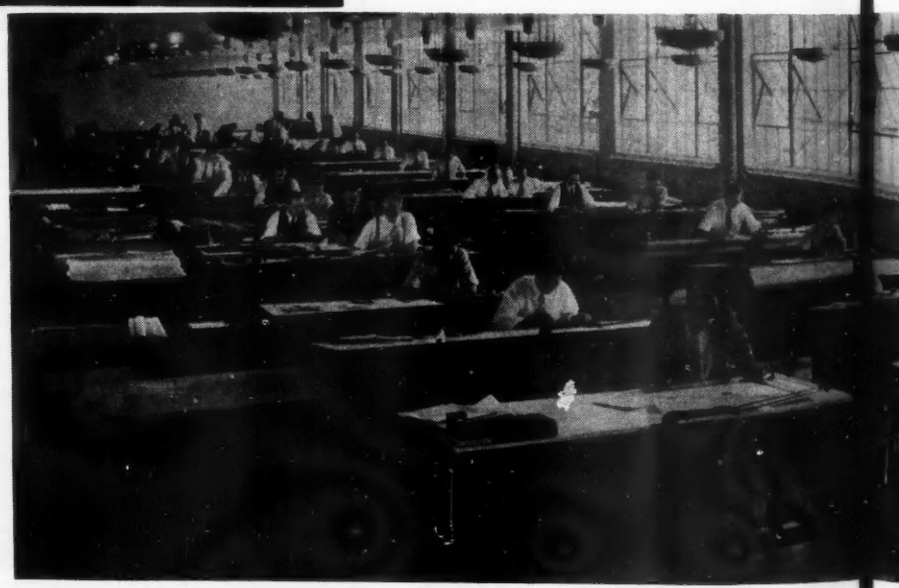
How far ahead does a car manufacturer plan? Even those close to the factory engineering departments may have to make several guesses. We were surprised, to say the least, to learn that the major program for the 1938 Olds line is fairly complete and that experimental cars already have been piling up road miles for several months.

In order to appreciate the modus operandi of the Olds engineering development, it is important to understand its organization set-up. Under H. T. Youngren, chief engineer, there are three major divisions — Experimental Engineering, headed by J. Wolfram; Chassis Engineering, headed by M. Thorne; and Body Engineering, headed by J. Oswald. The set-up of each division is given in detail on the Organization Chart. *(See page 556.)*

The investigation of new ideas, improvement of standard units, and all types of testing are vested in the experimental engineering division. Its department head controls the activity of the development engineers and the experimental manufacturing department which includes the machine shop, sheet metal shop, assembly department, and garage.

When scheduled projects have taken the hurdles in the experimental division, they are passed on to the chassis engineering department for final study. This department handles the design and drafting work on every unit, coordinating engineering design with factory practice through the shop contact engineers. This department, too, has the responsibility for production records and releases on every details of the product.

Body engineering has its own independent design functions and in addition, coordinates with the G.M. central Art and Color Section on new styling. This department has its own



The drafting room, a part of chassis engineering facilities, is distinguished by its modern equipment and excellent lighting. This section of the offices also is completely air-conditioned

"Beat the Gun" to Driver Needs

Designs and styles get "tryouts" that determine body and mechanical features for years to come

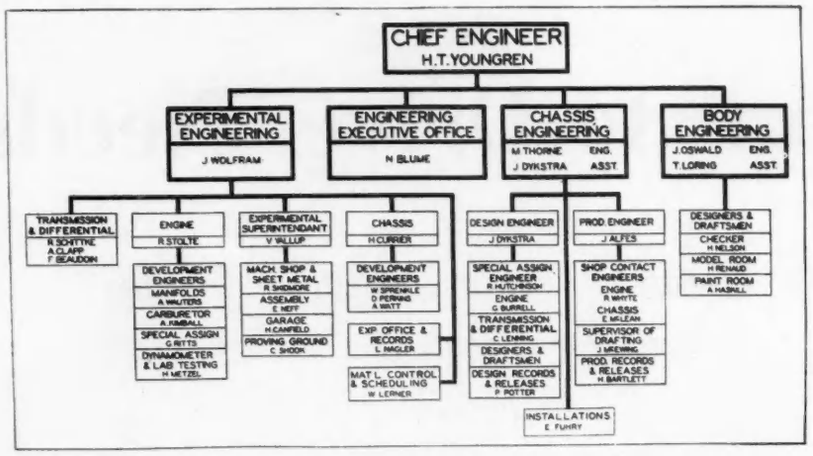
By Joseph Geschelin

model room for building clay models and full-scale wood models; it also has to do with the preparation of show models for the sales department.

With this set-up in mind, it is easier to appreciate the philosophy underlying the engineering development program. Basically, the pure objective is to plan for the future—many years ahead, in fact—in the design of major units and the general details of styling. Ideas come from many sources. First is the close contact with the central engineering division of General Motors Corp. This is coordinated with ideas from the Olds engineering staff and other members of the family. And finally, there is the constant flow of new ideas from the parts industry.

One of the characteristics of Olds engineering most favorable to the true engineering approach is the fact that its general manager, C. L. McCuen, comes from the engineering department and is most sympathetic to its work. Much of the advanced thinking

Propeller shaft characteristics are studied by means of the new high-speed G.M.R. balancing machine



Organization Chart for Oldsmobile engineering division

that finds its ultimate translation in paint and metal is due to his suggestions and support.

Apart from things that are radical or revolutionary in character, there is a constant program of investigation aimed at the improvement of the major elements of current design. The reasons for this are manifold. While there is always room for improvement and the elimination of "bugs," the fundamental problem goes much deeper. Where there is good cooperation between engineering and production, as is the case at Olds, there is a signal opportunity to effect basic changes or compromises in design so as to conform to the economics or limitations of the production process.

That, however, is but the starting point. Once the units are in production it is desirable to study the effect of manufacturing limitations on surface finish, on clearances and tolerances, etc., to the end that further refinements may be made to approach the ideal engineering function within the known manufacturing limitations.

Later in this article we shall cover the facilities of the Engineering Building in some detail. For the present we wish to mention some of the larger activities for which this unit is responsible—

Complete manufacture of engines and other units.

Complete manufacture of new and special sheet metal parts.

Complete assembly of experimental chassis and cars for road testing.

Production of show models for sales department use.

Among the bright spots in the research program is the all-time project of combustion chamber development which is being carried on in the flow-test department.

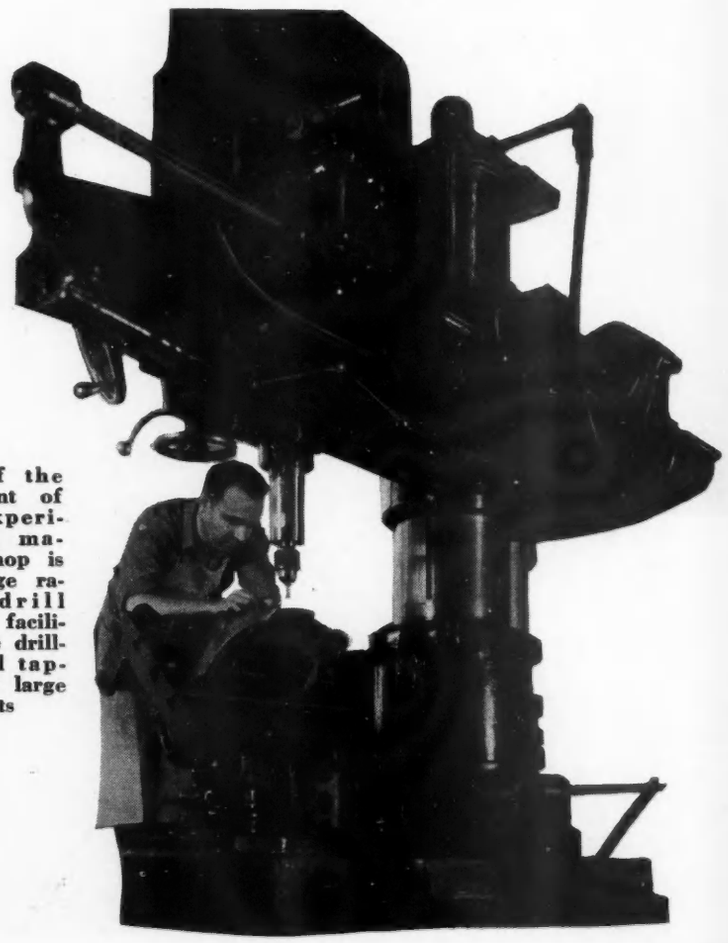
Another project under way in the radio experimental department is a study of receivers, speakers, antenna, and tone control problems as they apply to the Olds product.

Out of the gamut of projects that filter through the experimental department, perhaps the most comprehensive has been the one on clutch development. This work has extended without pause for a period of years, concentrating upon clutch discs, facings, spring design, pedal pressure, etc. The 1937 clutch incorporates the sum total of knowledge of these factors, embodying a new type of disc, unique disposition of spring elements, and a new type of woven clutch facing that promises to give better and longer life.

Details of Building

The engineering laboratories utilize approximately 90,000 sq. ft. of floor space in the new building. The garage, dynamic laboratories, cold room and electrical laboratory comprise half of the first floor, the other half being devoted to a service parts machine shop and a modern service garage, the latter two departments being under the management of the service department.

The second floor is divided into two sections, with the executive offices, drafting room, and records offices comprising one half; fabricating and assembly departments of the experimental division comprising the other half. A sound-proof partition minimizes noise transfer into the former section from the various machine and



Part of the equipment of the experimental machine shop is this huge radial drill which facilitates the drilling and tapping of large parts

The assembly department is equipped to assemble experimental chassis as well as complete cars. This view shows group of men tailor - fitting hand - made sheet metal parts for an experimental car

assembly shops. With the material control, machine shop, metal shop and car assembly departments in close proximity to each other on the second floor, smooth flow of work between these departments is assured, with the completed cars being moved to the garage by means of the elevator.

On the third floor is located the paint shop and the experimental department store room as well as an auditorium and an auto show display assembly department, these latter two divisions being under the supervision of the sales department. The auditorium in which conventions and meetings sponsored by the sales and advertising departments may be held is provided with a stage with a revolving turntable and facilities for motion picture projection. The auditorium is also used for civic meetings and for motion picture shows, parties, etc., given by the management for employees and their families.

The garage area is 19,000 sq. ft. Considerable foresight was given to concealing as far as possible all pipes and unsightly pieces of equipment. This is evidenced by the underground car exhaust system, the fan being outside the building. The alcohol and oil tanks are located in an underground pit near the building with pipes to four openings in the garage. Electrically controlled pumps maintain pressure on these lines. A 20,000-gal. gasoline tank has been installed for storage with meters at the tank and at the gasoline pump which serves all engineering cars at the garage exit.

New equipment adding considerably to the scope of engineering activity which can be carried through to completion, comprises chassis rolls, hoists, head lamp tester, Toledo scales for car weighing and tee slots in the floor. The chassis rolls are located in a large pit with ample room for observation under the car. The pit includes flood lights, a ventilating system for removing exhaust gas, and compressed air and electric outlets. Provisions have been made so that a 20 hp. D.C. motor can be installed to drive the rolls. This equipment is entirely new and fulfills a long felt want, making possible complete observation of the operating characteristics of the chassis.

Two Toledo scales have been installed, permitting the weighing of each end of the car simultaneously. A series of tee slots are placed in the floor to facilitate compressing the springs of the car and conducting whatever observations or checks are necessary.

Dynamic Laboratory

The dynamic laboratory has 8064 sq. ft. of floor space. It is 42 ft. wide and 192 ft. long and lies adjacent to the garage. Adjacent to the laboratory office is the carburetor flow room with the air conditioning equipment placed above the suspended ceiling.

One of the outstanding improvements in the dynamic laboratory is the localizing of noise. All of the water brakes are enclosed in one room, the room being equipped with mono-rail, unit heater and ventilating system. Four water brakes are in operation with an additional base for future expansion. Two of the dynamometers are enclosed, one in a sound-proof room similar to the water brake room; the other, in a Johns-Manville rockwool insulated silent room. The latter is the best installation of this type available and provides perfect facilities for the study of engine noises, as it not only eliminates outside noises but minimizes all room echoes. Dynamometer bases have been provided for seven dynamometers.

Engines driven on the water brakes and dynamometer stands are serviced by an accurately metered gasoline system and are cooled by a new soft water supply system served from an underground pit. A pump forces the water from this pit to two heat exchangers on the roof, and then into a 500-gal. storage tank.

The addition of a completely equipped cold room constitutes a major expansion in the facilities. The costly pocedure of transporting cars and personnel to the General Motors Research Laboratories is eliminated while complete research facilities of this sort are available at all times at the car division.

The cold room is 40 ft. by 24 ft. and will accommodate two cars and seven engines. The equipment as installed is guaranteed to maintain a continuous

temperature of minus 20 deg. F., with one engine in operation.

A General Electric chassis rolls with "V" belt drive to a dynamometer set-up outside the cold room is provided to permit driving a car under load conditions. An engine stand permitting a hook-up with this same drive system to the dynamometer also is available.

Electrical Laboratory

The radio laboratory is located in a large room which is screened with a grounded wire mesh cloth on all sides. The room is amply large to accommodate a car and provide additional room for test equipment. The effect of the screen is to shield out all radiated electrical energy, both the broadcast type and those interference signals generated by electric motors and other electrical apparatus.

Test equipment includes a "signal generator," which generates a radio frequency signal that can be varied by manual control both in regard to frequency and intensity. With this instrument it is possible to duplicate the radio frequency signal of any transmitting station.

An audio beat frequency oscillator which corresponds to the program portion of a broadcast station is used to generate an audio sine wave signal of measured strength and which can be varied from 10-15,000 cycles. This "program" signal is fed into the signal generator described above and modulates the generator carrier signal.

A "dummy" antenna designed to duplicate the car antenna is used to directly couple the signal generator to the car radio under test. The screen room effectively insures that the only signal being fed into the receiver is that generated by the test equipment. An output meter is connected to the receiver output (speaker disconnected) and is used to measure the audio output of the receiver in watts.

The radio laboratory conducts tests on commercial equipment and makes recommendations as to the adjustment or changes required in standard sets and loud speakers to conform with the requirements of the Olds product. The work also includes the development of the antenna equipment which is a part of the car structure.

Complete scientific equipment as well as an air-conditioned atmosphere are found in the flow-test department where combustion chamber development work is constantly in progress

Complete car tests, supplementing the preliminary work in the laboratory, include the following procedure:

1. Receiver noise when tuned to a weak station.
2. Ability of radio to receive a station without interference from other stations near the same frequency.
3. Ability of receiver to receive distant weak stations.
4. Ability of receiver to resist "fading out" on test stations, when car is driven in certain test locations.
5. Tone quality.
6. Reception under high speed car conditions.
7. Ignition interference.

Production Facilities

The car assembly department which assembles all test engines and cars, has a floor space of 8100 sq. ft. A Rex Degreaser for cleaning parts is a new piece of equipment in this department.

The floor space in the machine and sheet metal shop has been increased to 8900 sq. ft. and a number of new machines installed.

The floor space of the wood and model shop also has been increased and provided with new equipment consisting of a planer, jointer, band saw, lathe, sander and grinder. A cyclone system integral with the machines removes dust and shavings and assures clean, healthful working conditions.

The paint shop contains three paint booths of the latest Mahon type, each 20 ft. deep and 14 ft. wide. Each booth is equipped with a 14,000 cu. ft. per min. hydro-filter unit, complete with fan, drive and pumps. The shop has sufficient capacity not only for the requirements of the engineering department but also for those of the auto show display department.

The Science of Technical Surfaces

Technische Oberflächenkunde (The Science of Technical Surfaces), by Gustav Schmaltz, Dr.-Ing., M.D. Honorary Professor at Hanover Technical College. Published by Julius Springer in Berlin.

THIS book deals with the relatively new science of the surfaces of manufactured production and particularly machined surfaces, in which the author claims to have been a pioneer. He did some experimental work in this field in 1928 and 1929 and published his results in a series of articles in the *Zeitschrift des Vereines Deutscher Ingenieure* at that time.

The general theory of surface smoothness is discussed at length, and the author proposes a scale of eight degrees of roughness, starting with the surfaces of sand castings and rough forgings and ending up with highly polished surfaces. A distinction is made between macrogeometrical and microgeometrical irregularities, and only the latter are dealt with in the book. Microgeometrical investigations are defined as such where the investigation is confined to an area having a length of side or length of arc of the order of 1 mm. It is stated that the limit of accuracy in such investigations is of the order of 10^{-6} mm.

Surface characteristics can be studied in a number of different ways. The sim-

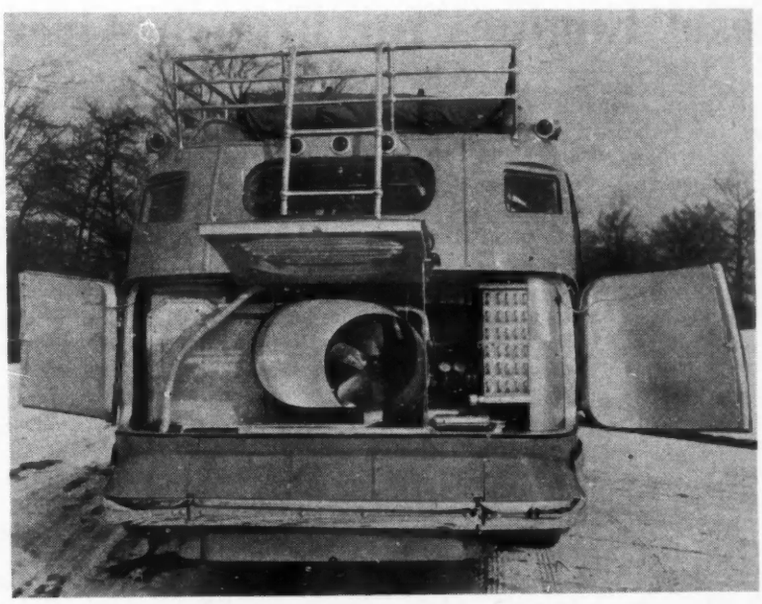
(Turn to page 566, please)

Nash-Kelvinator Air Conditioning Installed in White Research Coach

WITH the growing interest in air-conditioning for motor buses, the Kelvinator Division of Nash-Kelvinator Corp., Detroit, Mich., has installed its first complete mechanical air-conditioning unit in a White research coach.

This experimental job is built entirely from standard Kelvinator elements and, consequently, has nothing untried so far as mechanism is concerned. The objective of the coach tour of the South, for a period of three or four months, is to determine the economics of air-conditioned bus operation for the benefit of bus operators. It is hoped that this demonstration of the "Lord Kelvin" coach will provide many important answers, such as—Does the public want this comfort feature and is it willing to pay some premium for the ride? Can a new class of riders (those accustomed to using their own cars) be persuaded to use this deluxe transportation? What temperature and humidity differentials are most desirable for certain outside atmospheric conditions? And so forth.

Perhaps the most interesting feature of the Kelvinator unit is the fact that it is entirely self-contained in a special compartment in the rear end of the White bus. The latter is a modern streamlined vehicle with front engine mounting, accommodating 29 passengers and the driver. The unit is so designed as to be readily accessible for inspection or adjustments and may be removed entirely for major overhaul or replacement.



The Kelvinator unit is entirely self-contained in a special compartment in the rear of the White bus

Briefly, the air-conditioning system comprises a 5 hp. Kohler gasoline engine with magneto ignition, driving a 2-cylinder vertical compressor and the circulating fan through individual belts. Actually only four horsepower is required to drive this equip-

The air is forced to circulate in such a fashion as to envelop the passengers without a draft

ment for the specified load which is an interesting commentary on recent discussion concerning the size of unit required for automotive applications. The fan forces the cooled and dehumidified air through an air filter containing spun-glass filter elements which are inexpensive and readily replaceable. The entire unit, except for ducts weighs approximately 1200 lb. It is expected that this dead weight may be decreased very considerably by suitable design in volume production.

The system has a Btu. load capacity of 2¼ tons of refrigeration. It circulates conditioned air at the rate of 1000 cu. ft. per minute and draws in the outside air at the rate of 300 cu. ft. per min. The entire volume of air in the bus is conditioned every minute and there is a complete change of atmosphere every three minutes. Roughly, it is expected that a thermostat setting of 80 deg. Fahr. will provide the desired comfort conditions, this being based on a temperature differential of about 15 deg. Fahr. with respect to outside temperature and approximately 50 per cent relative humidity inside. Obviously, where the outside temperature exceeds 100 deg. Fahr. and in combination with higher humidity, the temperature within the bus will rise correspondingly.

In this system, outside air is drawn through ducts at the top-sides of the front end of the body and is lead directly to the cooling and dehumidifying element. Conditioned air is then forced through ducts along both sides of the body and enters the interior through suitable outlets built into the luggage compartment directly above the passenger seats. The air is forced to circulate in such fashion as to envelop the passengers indirectly, without the discomfort of a draft.

Kelvinator engineers are convinced that a satisfactory air-conditioning system depends entirely upon cooperation between the body builder and refrigeration experts. The customary body will not do; it is essential to have a special structure with good insulation, capable of maintaining standard conditions. Special body design combined with clean, filtered air, and comfortable temperature and humidity conditions — these are the features which will characterize future air-conditioned coaches.

The operation of the Kohler engine is continuous and is so controlled that the load on the engine varies with the demand for cooling and dehumidification. A thermostat inside the coach controls cooling and dehumidification. When bus comfort temperature is reached the thermostat closes an electrically-controlled valve thus stopping the flow of refrigerant.

When the crankcase pressure is reduced to a predetermined value a special control opens the by-pass valve between the discharge and the crankcase thus relieving the engine of the compression load. Should there occur a rise of temperature the thermostat opens the refrigerant valve resuming the flow of refrigerant to the cooling coil.

Diesel Engines for French Aircraft

FOUR makes of aircraft Diesel engines were exhibited at the recent Paris aircraft show and their chief characteristics were briefly summarized in a paper on Injection Engines by M. Andre Mandel read before the French Society of Automobile Engineers.

The CLM Junkers engine with four injection nozzles and two injection pumps per cylinder, inlet ports in the cylinder liners of such form as to create rotary motion of the air around the cylinder axis, motion parallel with the axis, and internal turbulence; a relatively-low scavenging pressure, 4.13-in. bore by 12.6-in. combined stroke. At 2100 r.p.m. this 980-cu. in. engine should give a good account of itself.

The Salmson 17770-cu. in. engine has U-shaped cylinders, a design which was experimented with by Zoller in 1924-26 and possibly earlier by others. With a relatively high scavenging (supercharging) pressure the engine operates at 1600 r.p.m. M. Mandel pointed out in this connection that according to his own experiments, in order to obtain a b.m.e.p. of 100-115 lb. per sq. in. at 1400 r.p.m., with a compression pressure of 570 lb. per sq. in., it is necessary to get from 91 to 97 per cent of a full charge of air into the cylinder before effective compression begins, and he expressed fears that prohibitive scavenging pressures would be required to operate an engine of this type at speeds exceeding 1500 r.p.m.

In addition to the above-mentioned two-stroke engines, two four-stroke engines were exhibited. The first of these was the Coatalen of 2200-cu. in. displacement, which operates at 2000 r.p.m. One of its features is its common-rail injection system, the injection valve being lifted during variable periods by the camshaft, which can be moved axially for control purposes. Injection pressures are varied by the injection pumps. No information was vouchsafed regarding the laws in accordance with which the duration and pressure of injection are varied and regarding the effects of accidental too early injections.

The Clerget 14-cylinder radial engine also is supercharged; it is of the double-combustion, double-injection type. Between the liner and the finned outer cylinder there is a temperature-equalizing liquid.

The Clerget six-cylinder in-line engine, of extremely robust design, is provided with an overhead camshaft, operates with double injection, supplied by duo-liquid pumps, and delivers 300 hp. (50 hp. per cylinder).

The Development of

Automatic Transmissions

By P. M. Heldt*

IN the early years of the automobile industry, when steam cars and electric vehicles furnished a standard of comparison, the control system of the gasoline automobile was generally regarded as crude and complicated. On the steam car a foot-operated throttle gave a continuous, smooth variation of driving torque over the whole range from zero to the maximum, and this was considered the ideal; on the electric, although changes in the driving torque took place in perceptible steps, there was no interruption in the drive as the change occurred, and the control, there too, was by a single device —the controller lever.

Several different types of transmission were used on the early gasoline cars, including the individual-clutch type, the planetary transmission, the sliding-gear transmission, and the friction drive. A highly flexible drive was badly needed at the time, owing to the lack of flexibility of the early engines, and it is therefore little wonder that the idea of an infinitely variable transmission for automobiles occupied the minds of inventors at an early date. Such a mechanism was developed by George S. Strong of New York as early as 1900, and a brief description of his transmission will be given a little farther on.

Aside from their lack of sufficient flexibility, the chief objection to the early transmissions was that they were difficult to handle. It was believed that this difficulty could be overcome by making the gear change or shift automatic, and it is a noteworthy fact that the first car with an automatic transmission was placed on the market as far back as 1904. This was the Sturtevant car produced in Boston. An illustrated description of its transmission appeared in *The Horseless Age* for Aug. 10, 1904.

By 1910 the sliding-gear transmission had come into use on nearly all stock cars, the one important exception being the Ford Model T, which retained the planetary gear until 1928. There was no basic change in transmissions during the second and third decades of the present century, although a number of cars were equipped with so-called preselective transmissions, with which, by means of a small lever carried on the steering post, the driver at any time could set the mechanism for the change he expected to become necessary next, and then, when the time for the change arrived, he would press down on the clutch pedal (or let up on the accelerator pedal) and the gear would be changed in accordance with the setting of the preselector lever—either by physical force exerted on the clutch pedal, by a solenoid, or by a vacuum cylinder. The so-called Electric Hand in use today belongs to this type of control mechanisms.

Toward the end of the 'twenties the Warner Gear Company brought out its Hi-Flex transmission, a four-speed design incorporating internal gears, and although this did not prove a permanent success, it caused such a stir in transmission circles that it must be considered as having definitely reopened the transmission problem. Since that time transmission gears have been made silent, and the gear-synchronizing device was introduced, which practically eliminated clashing and made shifting possible under all conditions, with the result that the conventional sliding or shifting transmission has become a rather satisfactory device — light and compact, highly efficient, easy to operate, silent in operation, and inexpensive to manufacture. Of course, a continuously-variable type would be preferable.

There seems to be only one really serious objection to the present type of conventional transmission, and that is that it calls for the use of three pedals for the control of the car. Two of these pedals, the accelerator and the brake, must be operated by the same foot, and the necessary shifting of the foot from the accelerator to the brake pedal adds to the time lag in bringing the car to a stop in an emergency; besides, it is inconvenient, and, in addition, there is the possibility of the foot slipping from the brake onto the accelerator pedal, or of the accelerator being depressed instead of the brake pedal by mistake. It would therefore seem that a transmission which reduces the number of pedals required to two would be a real improvement.

As hinted in the foregoing, transmis-

Part One

The transmission is a most vital part of the automobile. In this article the writer begins by digging into the dim past to show the need that prompted the present trend. Interspersed with historical "asides" the description of the development, step by step, to present day models makes interesting. as well as instructive reading.

* Presented at a meeting of the Philadelphia Section, S.A.E., Feb. 10, 1937.

sions may be divided into stepped and continuously-variable types. Either of these, of course, may be controllable or automatic. The driver in every case has control over the speed of the car by means of the accelerator. With some stepped transmissions, generally called "full automatic," the ratio of crankshaft revolutions to propeller-shaft revolutions (the gear ratio) is always the same for any given car speed or engine speed, which involves that the change from one ratio to a higher or a lower one always occurs at the same car speed, leaving the driver no control. It is now generally admitted that this is undesirable and that the driver should have a choice of ratios at any point of the speed range. Transmissions with which this is possible and in which changes in ratio normally occur automatically are referred to as semi-automatic.

Infinitely-Variable Transmissions

The first type of automobile transmission which made it possible to have an infinite number of gradations in the transmission ratio was the friction-disk drive. This was regular equipment on some four or five early cars, but it was only moderately successful with the low engine powers of that period, and it would be entirely impractical with our modern passenger-car engines of around 100 horsepower.

Another method of obtaining infinite variations in the speed ratio between driving and driven shafts is by the use of roller ratchets, which are also known as "mechanical valves." This mechanism can be made to transmit motion in both directions, so combining a reverse gear with a variable-speed gear for forward drive. Such a reversible roller-ratchet drive was invented by George S. Strong of New York, who for a long time was prominently connected with the roller-bearing industry.

A sectional view of Strong's reversible roller ratchet is shown in Fig. 1. It will be seen that a disk with a polygonal outer surface is keyed to the driven shaft. This disk is surrounded by a roller cage containing one roller for each of the "flats" on the disk. The cage and rollers are surrounded by an outer race of hardened steel. The roller cage is connected to the steel center by means of two straight keys, each of which has a helical feather key on its outside, so that by moving the key lengthwise in its seat, the angular relation of the roller cage to the steel center can be changed. Normally the rollers are located at the center of the flats or cam surfaces of the steel center, but if the keys are moved in one direction or the other, the rollers approach the edge of the cam surface, and if the outer rings or races to which the connecting rods are attached, are then moved angularly, the rollers are wedged in between the steel disks and the outer races, and angular motion is transmitted from the outer race to the steel center. The angular movement imparted to the steel center depends on the stroke or "throw" of the connecting rods, and means are provided by which the stroke can be varied gradually from zero to the maximum.

In the Strong transmission, which was fitted to a motor truck known as the Union, built in Philadelphia, the connecting rods connected to a crankpin projecting from the face of the engine flywheel. The crankpin was secured to a piston located in a radial cylinder machined in the flywheel; it was forced toward the center of rotation by a coil spring and away from it

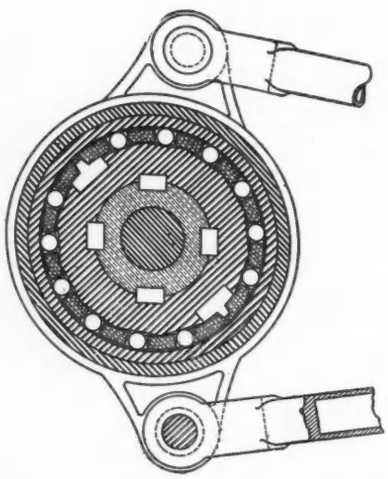


Fig. 1—Strong's reversible roller ratchet

by oil under pressure which entered the cylinder through a drilled passage extending the whole length of the crankshaft. The driver controlled the "gear ratio" by starting and stopping the oil pump, which was driven from the engine.

In 1925 Sensaud de Lavaud, who had achieved fame and fortune through the invention of a process of casting iron pipes centrifugally, came forward with an automatic transmission for automobiles, of which a sectional view is shown in Fig. 2. It embodied a number of roller ratchets on the rear axle, actuated by connecting rods extending to them from a wabbleplate mounted on the driving shaft. The angularity of the wabbleplate, and therefore the stroke of the connecting rods, was variable, and it varied automatically in accordance with the torque load on the axle, that is, with the resistance to motion. A spring consisting of a series of cupped washers tended to increase the angularity of the wabbleplate, while the torque reaction tended to decrease it. Assuming that the car has been running along under certain fixed operating conditions and that the wabbleplate has been held in a definite position by the balance between the spring pressure and torque reaction, if the resistance to the motion of the vehicle increases, the spring will be compressed farther and the angularity of the wabbleplate will be decreased, so that the stroke of the connecting rods is reduced, the car speed is reduced, and the engine is able to produce the greater driving torque necessary to overcome the greater resistance to motion.

With a transmission of this type it is possible to keep the engine operating under practically full torque regardless of the speed of the car, from which considerable gain in economy may be expected. De Lavaud applied his transmission to a number of cars and claimed a decrease in the fuel consumption of between 15 and 26 per cent, and a decrease in the oil consumption of as high as 50 per cent. This latter figure, while quite high, is credible in view of the known fact that the rate of oil consumption of an engine varies rapidly with changes in speed, and an infinitely-variable gear can be taken advantage of to hold down the engine speed. The economy figures given are based on a comparative test of two Voisin 10-hp. cars, one with the conventional transmission, the other with the De Lavaud drive, both cars being driven over the same route. Among the disadvantages of this transmission brought out by the test were that the rear-axle unsprung weight was increased by about 25 per cent and that the wabbleplate was unbalanced and set up resonance in the axle tube. In recent years de Lavaud has given up the wabbleplate type and has been working on hydraulic transmissions.

The latest development in the line of "variable-throw" automatic transmissions is the R.v.R. torque converter, which is regular equipment of the Minerva front-drive car exhibited at the recent Brussels show. This car has a 90-deg. V-8 engine mounted transversely in front and built integral with the transmission and differential housings. Independent suspension is used and the differential housing therefore is carried on the springs. The final drive is accomplished through four roller ratchets whose impulses are equally spaced. As may be seen from Fig. 2A (reproduced from The Autocar), the outer member of each roller ratchet connects by a link to a triangular rocking member, which in turn is linked to one of the throws of the engine crankshaft. The triangular member is pivoted to a transverse shaft held in a swinging frame, the frame being pivoted on an

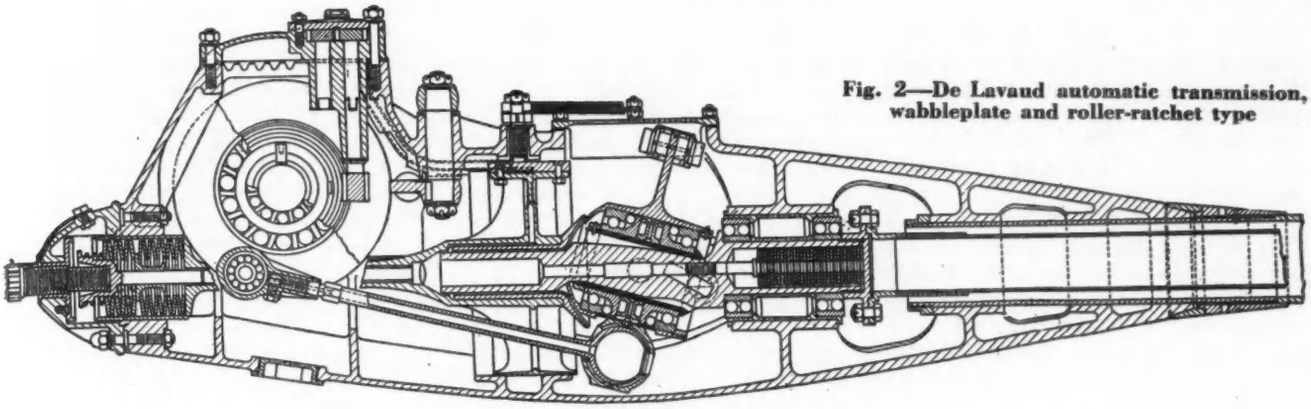


Fig. 2—De Lavaud automatic transmission, wabbleplate and roller-ratchet type

axis above and behind the crankshaft axis.

With the swinging frame in the position shown in the drawing, the link connecting to the roller ratchet is in a substantially tangential position, and the angular motion of the ratchet per cycle is therefore a maximum. For this setting the reduction ratio between crankshaft and differential gear is 2:1. It can readily be seen that if the pivot for the triangular member is moved farther away from the roller ratchet, the former and its link connection to the roller ratchet come more nearly into line, and a given oscillating motion of the triangular member then produces a smaller angular motion of the arm on the roller ratchet. In fact, with the pivoted frame in the extreme position to the right, oscillations of the triangular member produce no motion of the ratchet arm, so that the engine can be running without moving the car. Any intermediate speed ratio can be obtained and the gear is therefore continuously variable between the limits of 2:1 and infinity.

The position of the swinging arm is controlled by a stepped piston located in a double-ended cylinder, whose two ends communicate with the engine lubricating system. The piston can be subjected to the oil pressure in either direction, and flow of oil to one end or the other is controlled by a valve which is interconnected with the accelerator pedal. Unfortunately no details with respect to this control mechanism are available.

Hydraulic Transmissions

Another type of infinitely-variable transmission on which a great deal of work has been done with a view to adapting it to automotive uses is the hydraulic. Hydraulic transmissions naturally divide into two classes, hydrostatic and hydrodynamic. in the former the working fluid is placed under pressure in, and set in motion by, a pump, usually of the multi-cylinder plunger type, and the fluid moved by this pump acts on the pistons of a hydraulic motor. The rate at which power is being transmitted by such a device is measured by the product of the fluid pressure by the volume displaced by the plungers of the pump in unit time. In order to change the transmission ratio, the stroke of one of the two elements is varied, usually that of the pump. For instance, if the pump stroke is reduced to one-half, the speed of rotation of the pump and the horse-power input remaining the same, then the pressure to which the fluid is subjected will be doubled, and with twice the fluid pressure the torque on the shaft of the hydraulic motor will be doubled, while its speed will be halved, because of the lower rate of delivery by the pump.

One of the pioneers in hydrostatic transmissions was Chas. M. Manley, a former president of the S.A.E. Hydraulic transmissions for other than automotive purposes are being manufactured by the Waterbury Tool Co., Waterbury, Conn., and a sectional view of this transmission is shown in Fig. 3. It comprises a pump unit and a motor unit, arranged end to end, with a valve plate in between, all in the same housing. The pump unit is shown at the right and the motor unit at the left. Both units are of the round or barrel type, the plungers connecting the swashplates by means of short connecting rods. The swashplate of the pump unit is mounted in a tilting box whose inclination can be varied from zero to the maximum by means of a hand control.

It seems that with the great increase in the power of passenger-car engines during the past two decades, such hydrostatic transmissions have become entirely unsuitable for passenger-car use. All of the power transmitted is at all times converted first into hydraulic power and then converted back into mechanical power, and the double conversion involves considerable losses. It is rather doubtful whether such a transmission in automobile use under normal conditions would show more than

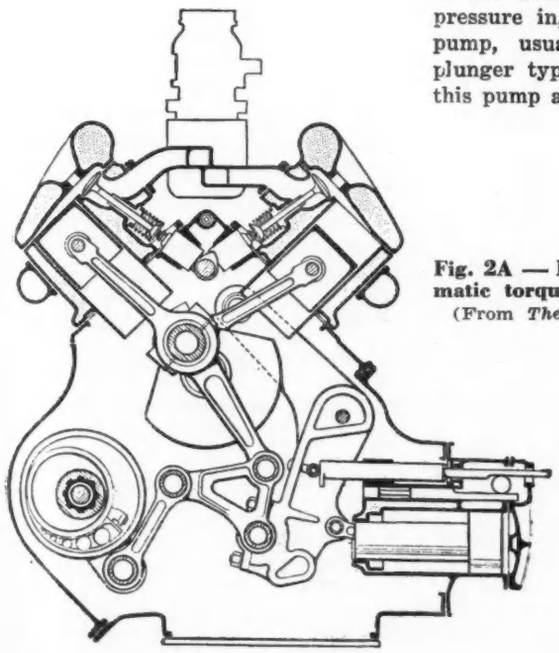


Fig. 2A — R.v.R. automatic torque converter (From *The Autocar*)

75 per cent efficiency, and a loss of 25 per cent of the power in the transmission would be highly objectionable. Moreover, if under hard driving conditions some 20 hp. were wasted in the transmission, it would be difficult to keep the oil in the units reasonably cool.

In hydrodynamic transmissions a fluid is set in motion by an impeller provided with blades or shovels. In this case power is being transmitted by setting the fluid in motion by the driving member and then letting it spend its kinetic energy on the blades of the driven member.

If both driving and driven member are inclosed in the same housing and the fluid passes directly from the blades of the driving to those of the driven member, the torque on the driven member will be no greater than that on the driving member, and as the speed of the driven member can never quite equal that of the driving member, we have a device akin to a slipping clutch. This device is widely used in England, and to some extent in France, in combination with planetary transmissions, being generally referred to as a fluid flywheel. In more correct technical terminology it is known as a hydraulic coupling. The various speeds of the planetary gear are engaged by applying friction brakes to drums associated therewith. There is no shifting of gears or of dog clutches engaging gears, and the fluid flywheel introduces a certain flexibility which prevents shocks. Although there is a slight loss in the "flywheel," under normal driving conditions it amounts to only a few per cent, and it is therefore much more efficient than the hydrostatic type of transmission. Of course, it must not be understood that the fluid flywheel is a substitute for, or an equivalent of, the hydrostatic transmission; it is not, since it is incapable of multiplying the torque.

The reason the fluid flywheel cannot increase the engine torque is that it has no member on which any additional torque could react. To obtain an increase in torque, a third set of blades must be provided, carried on a member that is mounted rigidly on the engine or on the chassis frame.

Hydraulic couplings and hydraulic torque converters can be combined with mechanical units in various ways, to secure automatic changes of gear ratio together with high efficiency of operation under most driving conditions. A transmission embodying this feature is the Lysholm-Smith, which was originally developed in Sweden and is now being manufactured in England by the firm of Leyland Motors, Ltd., and in Germany by the Krupp Works, for both bus and railcar installations. All multiplication of engine torque for acceleration and hill climbing is effected hydraulically, and changes in "gear ratio" take place automatically. When the vehicle approaches the normal driving speed, the driver sets the direct-drive pick-up lever by hand, and thereafter the drive is direct. Reverse is obtained by means of a special reversing gear which is combined with a double friction clutch and the hydraulic mechanism. There are four control members, viz., the accelerator pedal, the brake pedal, the direct-drive pick-up lever, and the reversing lever. The latter is normally in the position for forward drive and needs to be moved only when it is desired to back up. For railcars these transmissions are built without reverse.

Referring to the sectional view of this transmission (Fig. 4), at the left is seen the dual friction clutch, which is shown in the direct-drive position, the crankshaft being coupled directly to the propeller shaft. With the clutch control lever in the opposite position, the crankshaft is connected to the tubular shaft which carries the impeller of the hydraulic torque converter. It is not necessary to accelerate the vehicle with the friction clutch; the latter can be fully engaged before the vehicle starts, and acceleration is accomplished by means of the hydraulic unit, by opening the throttle and speeding up the engine. When the direct-drive pick-up lever is engaged the vehicle is already traveling at a speed close to normal, and there is therefore a minimum of slippage and a minimum of wear and tear on the clutch linings. This change, moreover, is made without interruption in the torque.

The hydraulic torque converter comprises a centrifugal pump and a three-stage hydraulic turbine in the same housing. The turbine wheel is connected to the propeller shaft through a free-wheeling unit, whose object is to disconnect the hydraulic unit from the drive mechanism when the direct drive is used, so that the impeller and turbine wheel will not rotate and will not cause any hydraulic losses. When making the change to direct drive, the operator lets up on the accelerator pedal slightly.

Inertia-Type Transmissions

A number of transmissions have been developed in which the inertia or centrifugal force of moving weights is made use of to transmit power from one shaft to another and to vary the ratio of the torques on the two shafts. In a number of these transmissions use is made of masses which rotate with

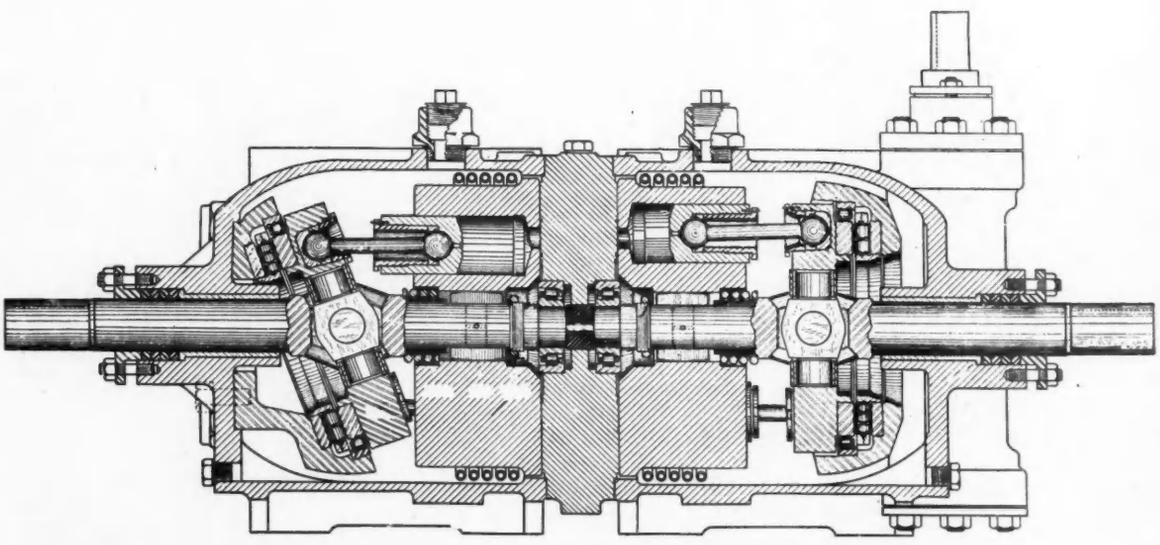


Fig. 3—Waterbury hydraulic torque converter (Hydrostatic type)

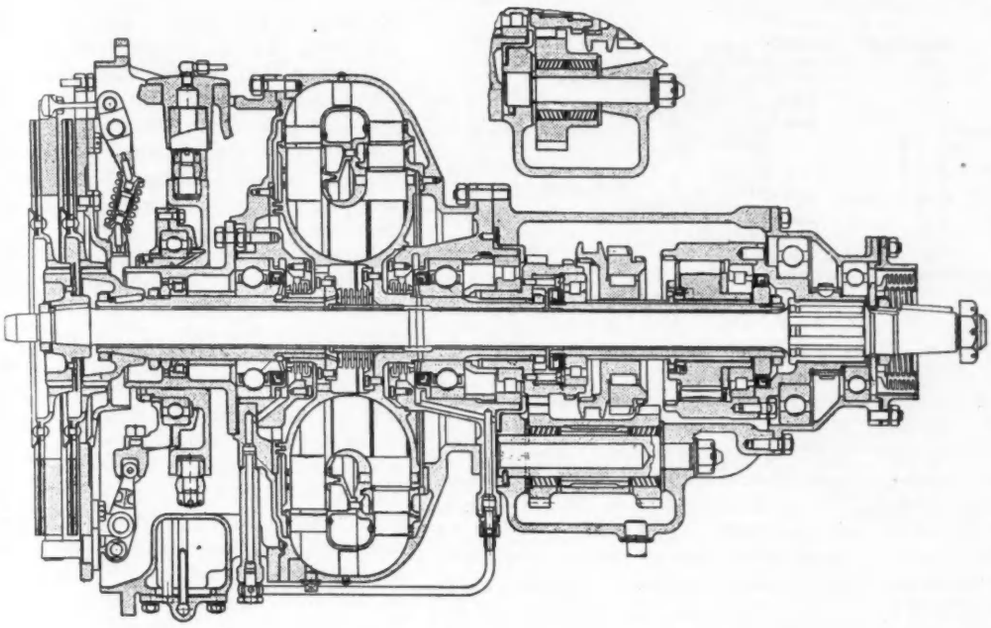


Fig. 4—Lysholm-Smith hydraulic torque converter with direct-drive feature

the flywheel of the engine but are so mounted on it that they can move in and out from the axis of rotation. When these masses are in the inner position, close to the axis of rotation, they have a certain amount of potential energy, the same as a mass which has been raised a certain distance above ground level, and in moving from the inner to the outer position they may be made to do useful work, such as turning the propeller shaft of a car. While the masses are brought back to their inner position, they absorb an equivalent amount of energy, which must, of necessity, come from the engine. It is therefore necessary that during each cycle the moving masses be placed in driving relation first with the engine, to bring them into their inner position, nearest the axis of rotation, and then with the driven shaft, in order to utilize the energy stored up in them for the propulsion of the car. Some sort of rapid-acting clutch is therefore necessary, and the device used is a development of the roller ratchet described in an earlier paragraph.

Fig. 5 (right) — Diagram showing inertia weights and eccentrics of Spontan automatic transmission

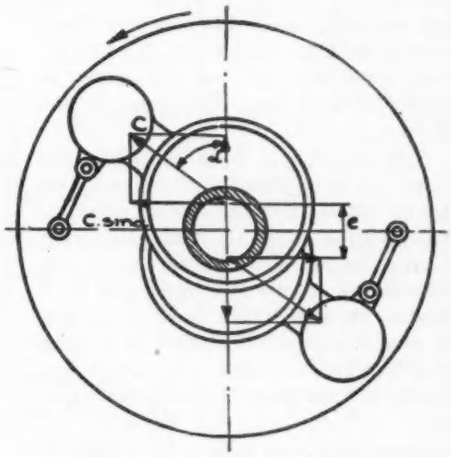


Fig. 5

Fig. 6 (below) — Double roller ratchet of Spontan transmission

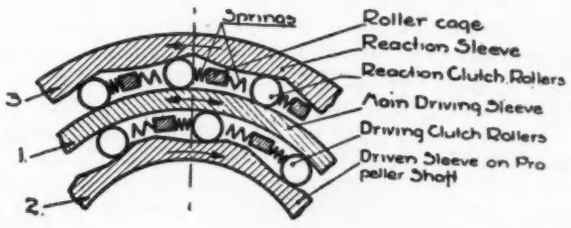


Fig. 6

One such transmission was developed in Sweden by Dr. F. Ljungstrom and was marketed as the "Spontan." A diagram of the principal parts of the mechanism is shown in Fig. 5. Two "bobweights" are mounted pivotally on the flywheel and rotate with it. These bobweights are connected to eccentric straps surrounding eccentrics on the driven shaft. The centrifugal force on the bobweights tends to make them move radially outward, and through the eccentrics they exert a turning moment or torque on the driven shaft; if the resisting moment on this shaft is less than the driving moment, the shaft will be turned.

As long as the car is at rest, the eccentrics are stationary, and if the engine is idling the bobweights will be turning and at the same time they will be reciprocated between their extreme positions with relation to the axis of the shaft. At a constant engine speed the bobweights will then impress an alternating torque on the eccentrics, which may be represented by a sine curve, the same as an alternating current. The direction of the torque changes twice during every revolution of the flywheel. These alternating torque impulses must be "rectified" before they can be utilized for the propulsion of the vehicle, and this is accomplished by means of the double roller-ratchet clutch of which a diagram is shown in Fig. 6. Sections of three concentric sleeves are shown. The middle one is the main driving sleeve on which the two eccentric sheaves are mounted; the inner one is the driven sleeve fastened to the propeller shaft, and the outer one is a reaction sleeve on which the reverse torque is taken up. The two roller clutches between the three sleeves are

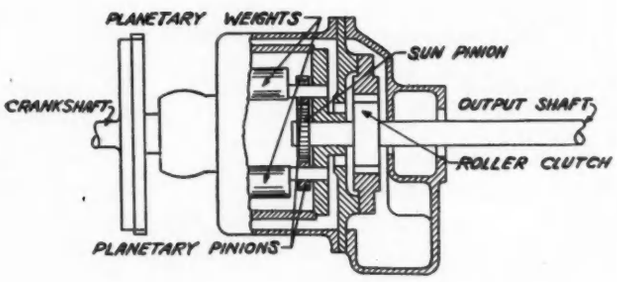


Fig. 7—Diagram of Hobbs inertia-type transmission

so arranged that they will be engaged by opposite motions of the main driving sleeve, which has an oscillating motion. When moving in one direction its torque is transferred to the driven sleeve on the propeller shaft, while when moving in the opposite direction the torque is impressed on the reaction sleeve. The reaction sleeve is held in position by springs and these springs are tensioned when the reaction sleeve is subjected to torque by the driving sleeve, and they give out the energy so stored during the other half of the cycle.

With a device as here described, the torque on the driving shaft when starting the car is naturally quite non-uniform, and as a matter of fact the start is very jerky. Once the car is started, the driving torque is evened out by a flywheel on the driven sleeve, and also by the torsional flexibility of a long propeller shaft, which winds and unwinds as the torque impulses wax and wane.

It seems apropos here to lay emphasis on the need for a reaction member in any kind of transmission in which the torque is to be multiplied under certain conditions. Inventors sometimes overlook this requirement, and I have been asked repeatedly to give an opinion on transmissions which were completely enclosed in a housing revolving with the flywheel and therefore had no point of reaction on the engine frame or car frame. The principle that action and reaction are equal and opposite applies to torques or moments as well as to forces. The reaction to the engine torque is represented by the side thrusts of the pistons against the cylinder walls. If the speed is reduced in the transmission, the torque should be increased, and any additional torque produced in the transmission must have a point of reaction somewhere.

The Spontan transmission was demonstrated to American manufacturers in 1930, and the company sponsoring it maintained an office in New York for a time, but it is my understanding that it has not been placed in production on a quantity basis.

Another infinitely-variable transmission in which use was made of inertia masses was developed in England in 1926 by Constantinesco, who made a name for himself by his development, during the period of the World War, of an hydraulic synchronizing gear for machine guns firing between the blades of airplane propellers. Constantinesco built one of these transmissions and applied it to a very small car fitted with a two-stroke engine of only about 30 cu. in. piston displacement.

A somewhat simplified form of inertia transmission, illustrated diagrammatically in Fig. 7, was exhibited at last year's commercial vehicle show in London. It is known as the Hobbs infinitely-variable transmission and was developed in Australia, or at least was an Australian invention. Connected to the engine flywheel is a drum which contains a sun pinion and a pair of planetary pinions meshing with it. If the sun pinion is held stationary and the housing rotates with the flywheel, the planetary pinions will revolve around their shafts, which latter are carried by the housing. These shafts are provided with unbalanced weights, and when they revolve, the weights naturally tend to assume a radially-outward position. While they are being brought to the inner position they absorb energy from the engine, and during the next half of the cycle, while they move outward again, they are capable of giving out this energy. Back of the sun wheel there is a roller ratchet which transmits only the forward impulses, and the irregularities in the torque impressed by it on the propeller shaft are smoothed out by the torsional flexibility of the latter, which is made of relatively small diameter and quite long. A flywheel at the far end of this shaft also helps to even out the driving torque.

Considering the great technical talent and the large financial resources of some of the men who have devoted themselves to the development of this type of transmission, and the very meager commercial results achieved by them to date, it does not appear that this principle holds out any great promise as to profitable applications in the automobile field.

Part Two will appear in an early issue

The Science of Technical Surfaces

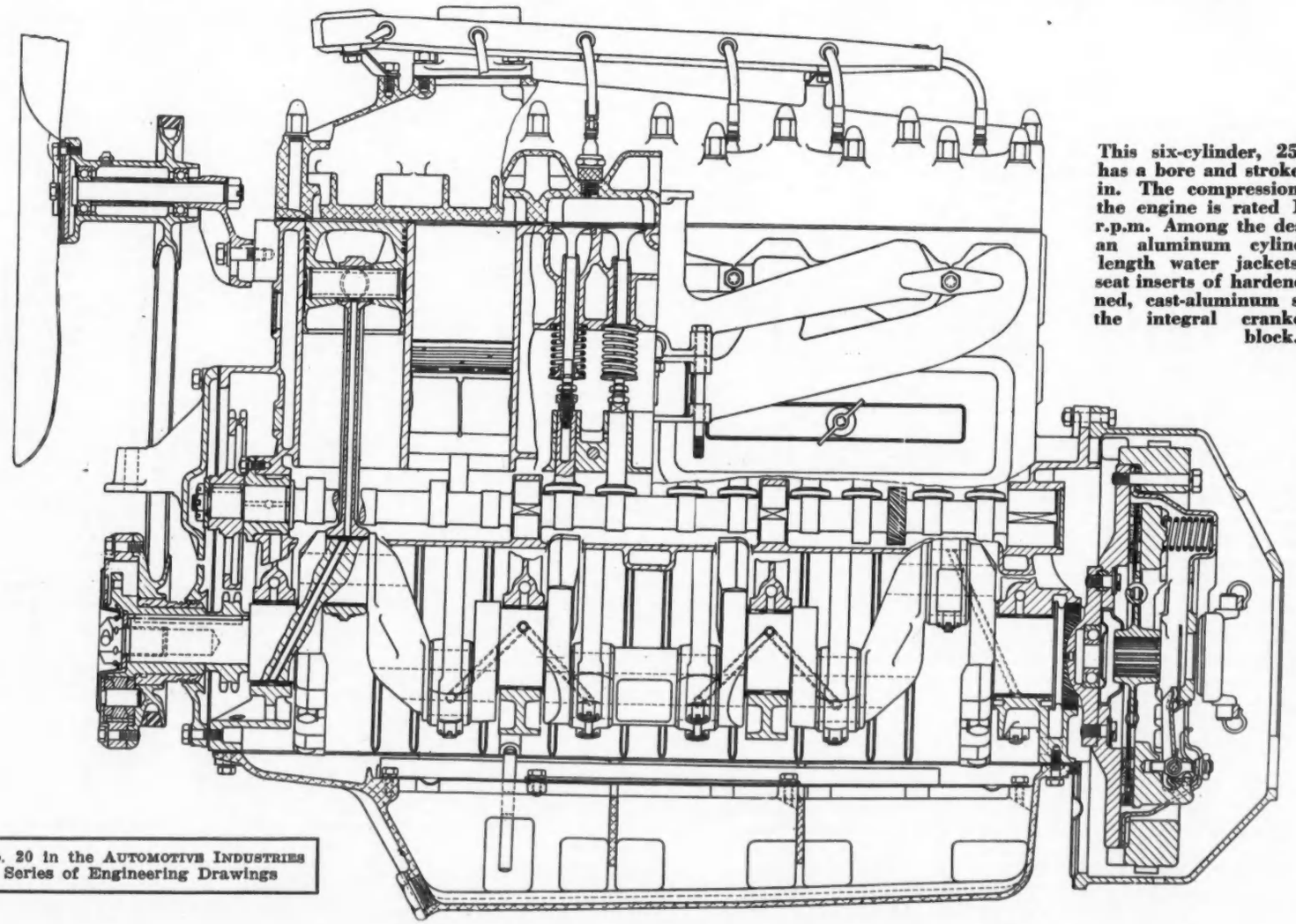
(Continued from page 558)

plest method is by the use of the sense of touch, passing over the surface to be investigated with the finger or the hand. Then, the surface may be viewed, either with the naked eye or with the aid of magnifying equipment. Then there are methods for the determination of surface faults in particular locations, such as the iron-dust or iron-filings method. Finally there is the method of the quantitative determination of the surface characteristics by which a curve of a section of the surface is drawn. There are also methods giving results or measurements between which and the degree of roughness of the surface there is some predetermined relationship. These include friction measurements, measurement of the resistance to flow, measurement of the degree of reflection of light rays and of the interference of X-rays and electronic rays. These latter methods give results which, since they are influenced by all elements of the surface under investigation, are of the nature of mean or integrated values.

The book also deals with such problems as surface characteristics and mechanical properties, surface characteristics and friction, surface characteristics and wear, surface characteristics and evaporation, surface characteristics and heat conductivity across the joint and fits.

A proposed standard for surface finishes is appended to the book in the form of a chart. It proposes four general grades of surface finish, designated by the capital letters A, B, C and D, each preceded by a capital S to signify "surface." The first and last grades are divided into two sub-grades, while the two intermediate grades are divided into five sub-grades each. The quality of the surface is measured by the maximum height of irregularities, which range from 0 to 0.3 μ for the finest surface finish to 315-1000 μ for the worst. The permissible maximum heights of irregularities are given for different grades of finish obtained by turning, planing boring, boring and reaming, milling with cylindrical miller, milling with face miller, grinding, lapping, polishing, scraping, broaching and arboring.

Humber "Snipe" Passenger-Car Engine

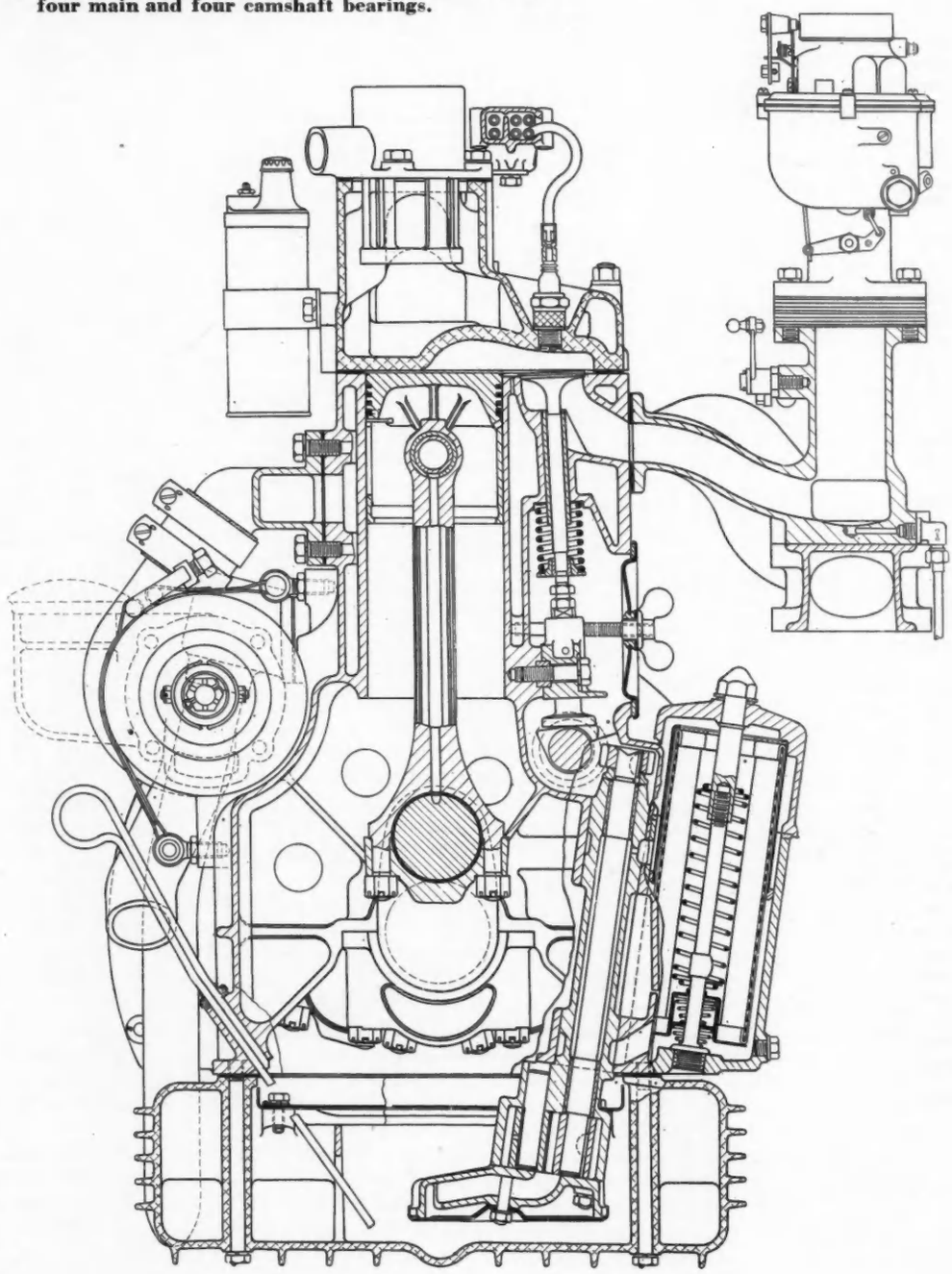


This six-cylinder, 250-cu. in. engine has a bore and stroke of 3.35 by 4.72 in. The compression ratio is 6 and the engine is rated 100 hp. at 3400 r.p.m. Among the design features are an aluminum cylinder head, full-length water jackets, exhaust-valve-seat inserts of hardened steel, and finned, cast-aluminum sumps bolted to the integral crankcase-and-cylinder block.

No. 20 in the AUTOMOTIVE INDUSTRIES Series of Engineering Drawings

Humber "Snipe" Passenger-Car Engine

This side elevation, partly in section, shows the torsional vibration damper at the front, the finned oil sump with screen and baffles, the spark plugs screwed directly into the aluminum head, floating piston pins restrained by snap rings, rifle-drilled connecting rods, exhaust-valve-seat inserts, etc. There are four main and four camshaft bearings.

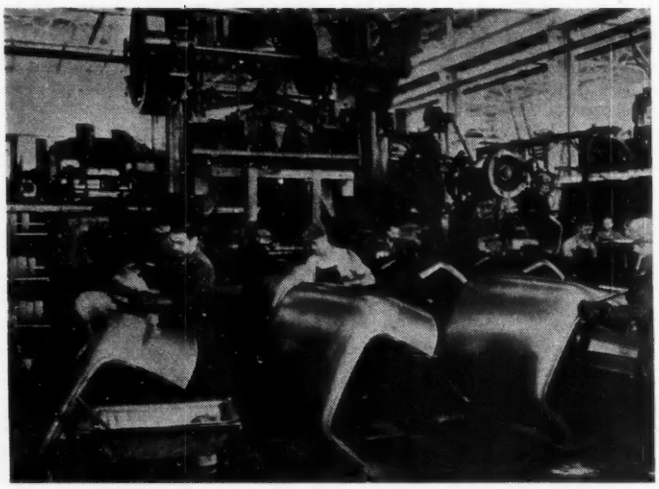


Prices, Weights and Wheelbases of 1937 Passenger Cars

Following are delivered prices at factory for cars with standard equipment and include all federal taxes with exception of Ford Motor Company. Optional equipment, state or local taxes, transportation charges and finance charges are extra.

BODY MAKE AND MODEL	No. of Pass.	No. of Doors	Delivered Price	Shipping Weight	Wheelbase	Rear Axle Ratio
BUICK						
*—6-wh. Equip. Special 40						
Sedan	5	2	914	3490	122	4.40
Sedan, trunk	5	2	940	3480	122	4.40
Sedan	5	4	950	3490	122	4.40
Sedan, trunk	5	4	976	3510	122	4.40
Business Coupe	2	2	868	3380	122	4.40
Sport Coupe	2-4	2	930	3445	122	4.40
Conv. Coupe	2-4	2	1011	3480	122	4.40
Conv. Phaeton	5	4	1257	3630	122	4.40
Century 60						
Sedan	5	2	1127	3720	126	3.90
Sedan, trunk	5	2	1152	3750	126	3.90
Sedan	5	4	1162	3750	126	3.90
Sedan, trunk	5	4	1188	3720	126	3.90
Sport Coupe	2-4	2	1142	3660	126	3.90
Conv. Coupe	2-4	2	1224	3715	126	3.90
Conv. Phaeton	5	4	1479	3840	126	3.90
Roadmaster 80						
Phaeton, trunk*	6	4	1756	4214	131	4.22
Sedan, trunk	6	4	1418	4159	131	4.22
Formal Sed., trk.	6	4	1541	4229	131	4.22
Limited 90*						
Sedan, trunk	8	4	2140	4549	138	4.62
Limousine, trk.	8	4	2242	4599	138	4.62
Sedan, trunk	6	4	1966	4469	138	4.62
Formal Sed., trk.	6	4	2140	4409	138	4.62
CADILLAC						
V8-Series 60						
Sport Coupe	2-4	2	1555	3710	124	3.69
Touring Sedan	5	4	1650	3845	124	3.69
Conv. Coupe	2-4	2	1690	3745	124	3.69
Conv. Sedan	5	4	2020	3885	124	3.69
V8-Series 65						
Touring Sedan	5	4	2090	4385	131	4.30
V8-Series 70						
Sport Coupe	2-4	2	2805	4285	131	4.30
Touring Sedan	5	4	2595	4420	131	4.30
Conv. Coupe	2-4	2	2905	4325	131	4.30
Conv. Sedan	5	4	2960	4460	131	4.30
V8-Series 75						
Touring Sedan	5	4	2815	4745	138	4.60
Formal Sedan	5	4	3685	4745	138	4.60
Town Sedan	5	4	3325	4780	138	4.60
Conv. Sedan	5	4	3630	4980	138	4.60
Touring Sedan	7	4	2970	4825	138	4.60
Imp. Tour. Sedan	7	4	3170	4985	138	4.60
Town Car	7	4	4755	5055	138	4.60
Spec. Tour. Sed.	7	4	2810	4825	138	4.60
Spec. I. Tr. Sed.	7	4	2810	4985	138	4.60
Bus. Tour. Sed.	8	4	2745	4825	138	4.60
Bus. I. Tour. Sed.	8	4	2950	4985	138	4.60
V12-Series 85						
Touring Sedan	5	4	3535	5050	138	4.60
Touring Sedan	7	4	3690	5130	138	4.60
Imp. Tour. Sedan	7	4	3890	5165	138	4.60
Town Sedan	5	4	4045	5000	138	4.60
Formal Sedan	5	4	4400	5050	138	4.60
Conv. Sedan	5	4	4350	5165	138	4.60
Town Car	7	4	5475	5230	138	4.60
V16-Series 90						
Coupe	2	2	7645	5840	154	4.64
Conv. Coupe	2	2	7800	6050	154	4.64
Sedan	5	4	7545	....	154	4.64
Conv. Sedan	5	4	8105	6100	154	4.64
Town Sedan	5	4	7495	6085	154	4.64
Town Cabriolet	5	4	9025	....	154	4.64
Imp. Cabriolet	5	4	8055	6210	154	4.64
Conv. Coupe	5	2	8105	....	154	4.64
Limousine	7	4	7800	6190	154	4.64
Town Cabriolet	7	4	9130	....	154	4.64
Sedan	7	4	7595	6190	154	4.64
Lim. Brougham	7	..	9025	....	154	4.64
Imp. Cabriolet	7	4	8105	....	154	4.64
CHEVROLET						
Master						
Sedan	5	4	667	2845	112½	3.73
Coach	5	2	606	2800	112½	3.73
Town Sedan, trk.	5	2	624	2830	112½	3.73
Sport Sedan, trk.	5	4	685	2885	112½	3.73
Business Coupe	2	2	588	2770	112½	3.73
Cabriolet	5	2	694	2790	112½	3.73
Master Del.						
Sedan	5	4	739	2935	112½	4.22
Coach	5	2	672	2910	112½	4.22
Town Sedan, trk.	5	2	690	2935	112½	4.22
Sport Sedan, trk.	5	4	757	2960	112½	4.22
Business Coupe	2	2	655	2840	112½	4.22
Sport Coupe	2-4	2	693	2880	112½	4.22
CHRYSLER						
Royal Six						
Business Coupe	2	2	810	3049	116	4.10
Coupe	2-4	2	860	3099	116	4.10
Conv. Coupe	2-4	2	1020	3274	116	4.10
Brougham	5	2	870	3114	116	4.10
Tour. Brougham	5	2	880	3094	116	4.10
Sedan	5	4	910	3124	116	4.10
Touring Sedan	5	4	920	3134	116	4.10
Conv. Sedan	5	4	1355	3484	116	4.10
Sedan	7	4	1145	3544	133	....
Sedan Limousine	7	4	1245	....	133	....
Imperial						
Business Coupe	2	2	1030	3374	121	4.10
Coupe	2-4	2	1070	3449	121	4.10
CHRYSLER cont.						
Conv. Coupe	2-4	2	1170	3609	121	4.10
Tour. Brougham	5	2	1070	3544	121	4.10
Touring Sedan	5	4	1100	3564	121	4.10
Conv. Sedan	5	4	1500	3824	121	4.10
Cust. Imp.						
Sedan	7	4	2060	4522	140	4.55
Sedan Limousine	7	4	2160	4644	140	4.55
Airflow						
Coupe	6	2	1610	4300	128	4.30
Sedan	6	4	1610	4225	12	4.30
CORD						
West. Sedan	5	4	2445	3715	125	....
Beverly Sedan	5	4	2545	3800	125	....
Cabriolet	2	2	2595	3815	125	....
Phaeton Sedan	5	4	2645	3864	125	....
Custom Beverly	5	4	2960	3900	132	....
Custom Berline	5	4	3060	4120	132	....
Supercharged						
West. Sedan	5	4	2860	3765	125	....
Beverly Sedan	5	4	2960	3850	125	....
Cabriolet	2	2	3010	3865	125	....
Phaeton Sedan	5	4	3060	3914	125	....
Custom Beverly	5	4	3375	3950	132	....
Custom Berline	5	4	3575	4170	132	....
DE SOTO						
Business Coupe	3	2	770	3038	116	4.10
Coupe	3-5	2	820	3088	116	4.10
Conv. Coupe	3-5	2	975	3225	116	4.10
Brougham	6	2	830	3123	116	4.10
Tour. Brougham	6	2	840	3148	116	4.10
Sedan	6	4	870	3123	116	4.10
Touring Sedan	6	4	880	3148	116	4.10
Conv. Sedan	5	4	1300	3441	116	4.10
Sedan	7	4	1120	3451	133	4.10
Limousine	7	4	1220	....	133	4.10
DODGE						
Bus. Coupe	2	2	715	2902	115	4.10
Coupe	2-4	2	770	2967	115	4.10
Conv. Coupe	2-4	2	910	3057	115	4.10
Sedan	5	2	780	2992	115	4.10
Touring Sedan	5	2	790	2997	115	4.10
Sedan	5	4	820	2982	115	4.10
Touring Sedan	5	4	830	2997	115	4.10
Conv. Sedan	5	4	1230	3262	115	4.10
Sedan	7	4	1075	3367	132	4.10
Limousine	5	4	1175	....	132	4.10
FORD						
V8-80						
Tudor Sedan	5	2	544	2513	112	4.44
Tudor Tour. Sed.	5	2	569	2523	112	4.44
Fordor Sedan	5	4	604	2543	112	4.44
Fordor Tr. Sed.	5	4	629	2553	112	4.44
Coupe, 5 window	2-4	2	529	2383	112	4.44
Std. V8-85						
Tudor Sedan	5	2	585	2728	112	3.78
Tudor Tour. Sed.	5	2	610	2760	112	3.78
Fordor Sedan	5	4	645	2761	112	3.78
Fordor Tr. Sedan	5	4	670	2778	112	3.78
Coupe, 5 window	2-4	2	570	2608	112	3.78
De Luxe V8-85						
Tudor Sedan	5	2	648	2768	112	3.78
Fordor Sedan	5	4	708	2783	112	3.78
Roadster	2	2	693	2688	112	3.78
Phaeton	5	4	748	2803	112	3.78
Coupe	2-4	2	633	2618	112	3.78
Tudor Tour. Sed.	5	2	673	2791	112	3.78
Fordor Tr. Sedan	5	4	733	2808	112	3.78
Cabriolet	..	2	693	2728	112	3.78
Conv. Sedan	..	..	858	2973	112	3.78
Conv. Cabriolet	..	..	758	2748	112	3.78
Club Coupe	2-4	2	693	2728	112	2.78
GRAHAM						
Series 6-85						
Touring Sedan	5	2	690	2860	111	4.55
Tour. Sed.,trk.	5	2	720	2675	111	4.55
Touring Sedan	5	4	770	2695	111	4.55
Tour. Sed., trk.	5	4	795	2715	111	4.55
Cavalier						
Series 6-95						
Business Coupe	3	2	850	2815	116	4.45
Coupe	3-5	2	900	2880	116	4.45
Conv. Coupe	3-5	2	945	....	116	4.45
Touring Sedan	5	2	875	2930	116	4.45
Tour. Sed., trk.	5	2	905	2960	116	4.45
Touring Sedan	5	4	905	2930	116	4.45
Tour. Sed., trk.	5	4	935	2945	116	4.45
Supercharger						
Series 116						
Business Coupe	3	2	1015	2975	116	4.27
Coupe	3-5	2	1045	3040	116	4.27
Conv. Coupe	3-5	2	1080	....	116	4.27
Touring Sedan	5	2	1020	3105	116	4.27
Touring Sedan	5	4	1050	3125	116	4.27
Tour. Sed., trk.	5	2	1050	3105	116	4.27
Tour. Sed., trk.	5	4	1080	3125	116	4.27
Cust. Super.						
Series 120						
Business Coupe	3	2	1105	3020	120	4.27
Coupe	3-5	2	1135	3055	120	4.27
Conv. Coupe	..	2	1170	....	120	4.27
Touring Sedan	5	4	1160	3200	120	4.27
Tour. Sed., trk.	5	4	1190	3200	120	4.27
HUDSON						
Custom 6-73						
Business Coupe	2	2	815	....	122	4.11
Coupe	3	2	860	2805	122	4.11
Brougham	5	2	885	2925	122	4.11
Tour. Brougham	5	2	910	2925	122	4.11
Victoria Coupe	..	..	905	....	122	4.11
Sedan	5	4	935	2990	122	4.11
Touring Sedan	5	4	960	2990	122	4.11
Conv. Coupe	..	2	960	....	122	4.11
Conv. Brougham	5	2	1045	....	122	4.11
De Luxe 8-74						
Coupe	3	2	900	3010	122	4.11
Brougham	5	2	955	3105	122	4.11
Victoria Coupe	3-5	2	970	3055	122	4.11
Tour. Brougham	5	2	980	3105	122	4.11
Sedan	5	4	995	3135	122	4.11
Touring Sedan	5	4	1020	3135	122	4.11
Conv. Coupe	3-5	2	1035	....	122	4.11
Conv. Brougham	5	2	1120	....	122	4.11
Custom 8-75						
Coupe	3	2	1005	3055	122	4.11
Brougham	5	2	1045	3135	122	4.11
Victoria Coupe	3-5	2	1055	3085	122	4.11
Tour. Brougham	5	2	1070	3135	122	4.11
Sedan	5	4	1095	3195	122	4.11
Touring Sedan	5	4	1120	3195	122	4.11
Conv. Coupe	..	2	1130	....	122	4.11
Conv. Brougham	5	2	1215	....	122	4.11
De Luxe 8-76						
Sedan	5	4	1020	3205	129	4.11
Touring Sedan	5	4	1045	3205	129	4.11
Custom 8-77						
Sedan	5	4	1120	3260	129	4.11
Touring Sedan	5	4	1145	3260	129	4.11
LA SALLE						
Coupe	2	2	1095	3675	124	3.92
Conv. Coupe	2	2	1290	3715	124	3.92
Touring Sedan	5	2	1215	3780	124	3.92
Touring Sedan	5	4	1260	3810	124	3.92
Conv. Sedan	5	4	1620	3850	124	3.92
LINCOLN						
V-12						
Conv. Roadster	2-4	2	4950	5335	136	4.58
Coupe	2	2	4950	5335	136	4.58
Wilby Coupe	5	2	5550	....	136	4.58
Sedan	5	4	4450	5690	136	4.58
Brunn Victoria	5	..	5550	....	136	4.58
Wilby Touring	7	4	5550	....	145	4.58
Jud. Berline-2W	4	..	5650	5850	145	4.58
Jud. Berline-3W	4	..	5750	....	145	4.58
Jud. Sed. Lim.	7	4	5950	....	145	4.58
Brunn Cabriolet	5	..	6650	5835	145	4.58
Brunn Cabriolet	5	..	6750	5810	145	4.58
Brunn Tour. Cab.	5	..	6950	....	145	4.58
Brunn Brougham	7	..	6750	5530	145	4.58
Sedan	7	4	4750	5840	145	4.58
Limousine	7	4	4850	5935	145	4.58
Conv. Sed. LeB.	5	4	5450	....	145	4.58
Conv. Sed. LeB.	5	4	5650	....	145	4.58
Wilby Limousine	7	4	5850	6000	145	4.58
Wilby Sport Sed.	5	4	6850	....	145	4.58
Wilby Panel Bro.	7	4	7050	....	145	4.58
LINCOLN—ZEPHYR						
Coupe	3	2	1165	....	122	4.44
Sedan	5	4	1265	....	122	4.44
Coupe-Sedan	5	2	1245	....	122	4.44
Town Limousine	5	4	1425	....	122	4.44
NASH						
Lafayette-400						
Coupe	3	2	705	3140	117	4.11
Coupe	3-5	2	760	3190	117	4.11
Victoria Sedan	6	2	765	3200	117	4.11
Sedan	6	4	810	3240	117	4.11
Cabriolet	5	2	850	3180	117	4.11
Ambassador 6						
Coupe	3	2	870	3290	121	4.11
Coupe	3-5	2	910	3340	121	4.11
Victoria Sedan	6	2	910	3380	121	4.11
Sedan	6	4	960	3400	121	4.11
Cabriolet	5	2	975	3320	121	4.11
Ambassador 8						
Coupe	3	2	990	3590	125	4.11
Coupe	3-5	2	1030	3640	125	4.11
Victoria Sedan	6	2	1030	3690	125	4.11
Sedan	6	4	1080	3720	125	4.11
Cabriolet	5	2	1095	3640	125	4.11
OLDSMOBILE						
Six						
Sedan	5	2	825	3275	117	4.37
Tour. Sed., trk.	5	2	850	3275	117	4.37
Sedan	5	4	875	3310	117	4.37
Tour. Sed., trk.	5	4	900	3295	117	4.37
Business Coupe	2	2	765	3220	117	4.37
Conv. Coupe	2-4	2	920	....	117	4.37
Club Coupe	2-4	2	825	3210	117	4.37
Eight						
Business Coupe	2	2	880	3395	124	4.37
Club Coupe	2-4	2	940	3405	124	4.37
Sedan	5	2	940	3480	124	4.37
Touring Sedan	5	2	965	3480	124	4.37
Sedan	5	4	990	3510	124	4.37
Touring Sedan	5	4	1015	3495	124	4.37
Conv. Coupe	2-4	2	1035	....	124	4.37
PACKARD						
*—6-wh. Equip. Six-115C						
Touring Sedan	5	4	1010	3310	115	4.36
Sedan	5	4	995	3265	115	4.36
Club Sedan	5	4	1000	3275	115	4.36
Touring Coupe	5	2	960	3235	115	4.36
Sport Coupe	2-4	2	940	3215	115	4.36
Conv. Coupe	2-4	2	1010	3285	115	4.36
Business Coupe	2	2	895	3140	115	4.36
Eight-120C						
Touring Sedan	5	4	1185	3520	120	4.09
Sedan	5	4	1170	3465	120	4.09
Club Sedan	5	4	1175	3455	120	4.09
Touring Coupe	5	2	1135	3435	120	4.09
Sport Coupe	2-4	2	1110	3415	120	4.09
Conv. Coupe	2-4	2	1185	3485	120	4.09
Conv. Sedan	5	4	1485	3630	120	4.09
Business Coupe	2	2	1065	3340	120	4.09
De Luxe-120C						
Touring Sedan	5	4	1400	3550	120	4.09
Club Sedan	5	4	1390	3485	120	4.09
Touring Coupe	5	2	1350	3485	120	4.09
Touring Sedan	7	4	1835	3835	138	4.09
Tour. Limousine	7	4	1985	3900	138	4.09
Super Eight						
1500						
Touring Sedan	5	4	2480	4530	127	4.69
1501						
Formal Sedan	5	4	3400	4795	134	4.69
Touring Sedan	5	4	2685	4670	134	4.69
Club Sedan	5	4	2680	4600	134	4.69
Coupe	5	2	2660	4595	134	4.69
Coupe	2-4	2	2565	4585	134	4.69
Coupe Roadster	2-4	2	2830	4580	134	4.69
Victoria	5	2	3310	4650	134	4.69
1502						
Touring Sedan	7	4	2860	4700	139	4.69
Tour. Limousine	7	4	2995	4815	139	4.69
Conv. Sedan	5	4	3515	4945	139	4.69
Business Sedan	5–8	4	2730	....	139	4.69
Bus. Limousine	5–8	4	2870	....	139	4.69
Twelve-1506						
Touring Sedan	5	4	3670	5335	132	4.41
1507						
Formal Sedan	5	4	4455	5500	139	4.41
Touring Sedan	5	4	3740	5525	139	4.41
Club Sedan	5	4	3845	5520	139	4.41
Coupe	5	2	3770	5415	139	4.41
Coupe*	2-4	2	3720	5255	139	4.41
Coupe Rdstr*	2-4	2	3750	5255	139	4.41
Victoria*	5	2	4815	5345	139	4.41
1508						
Touring Sedan	5–7	4	4070	5600	144	4.41
Tour. Limousine	5–7	4	4275	5560	144	4.41
Conv. Sedan*	5	4	4975	5680	144	4.41
PIERCE-ARR'W						
Eight-1701						
Sedan	5	4	3375	5675	138	4.58
Club Sedan	5	4	3480	5800	138	4.58
Coupe	2-4	2	3375	5645	138	4.58
Conv. Roadster	2-4	2	3480	5590	138	4.58
Club Berline	5	4	3830	....	138	4.58
Formal Sedan	5	4	3630	....	138	4.58
Sedan	7	4	3690	5820	144	4.58
Enc. Dr. Lim.	7	4	3840	5860	144	4.58
Brunn Town Bro.	7	4	5520	5840	144	4.58
Conv. Sedan	5	4	4300	....	144	4.58
Twelve-1702						
Sedan	5	4	3895	5920	138	4.58
Club Sedan	5	4	4000	5850	138	4.58
Coupe	2-4	2	3895	5855	138	4.58
Conv. Roadster	2-4	2	4000	5800	138	4.58
Club Berline	5	4	4155	....	138	4.58
Formal Sedan	5	4	4155	....	138	4.58
Sedan	7	4	4210	6065	144	4.58
Enc. Dr. Lim.	7	4	4360	6105	144	4.58
Brunn Town Bro.	7	4	6040	6085	144	4.58
Conv. Sedan	5	4	4820	5921	144	4.58
1703						
Sedan	7	4	5015	6125	147	4.58
Enc. Dr. Lim.	7	4	5220	6145	147	4.58
PLYMOUTH						
P3						
Coupe	2	2	580	2771	112	3.90
Sedan	5	2	620	2841	112	3.90
Sedan	5	4	665	2841	112	3.90
De Luxe-P4						
Coupe	2	2	650	2839	112	4.10
Coupe	2-4	2	700	2884	112	4.10
Conv. Coupe	2-4	2	830	2994	112	4.10
Sedan	5	2	715	2899	112	4.10
Sedan	5	4	745	2914	112	4.10
Touring Sedan	5	2	725	2914	112	4.10
Touring Sedan	5	4	755	2914	112	4.10
Sedan	7	4	995	3333	132	4.10
Sedan Limousine	7	4	1095	....	132	4.10
PONTIAC						
De Luxe-Six						
Business Coupe	2	2	736	3140	117	4.37
Sedan	5	2	785	3225	117	4.37
Sport Coupe	2-4	2	808	3150	117	4.37
Touring Sedan	5	2	810	3210	117	4.37
Cabriolet	4	2	900	3150	117	4.37
Sedan	5	4	836	3235	117	4.37

(Turn to page 574, please)



Burnishing commercial cab tops as they come out of the presses at Chevrolet

Production Lines

Transport Fastenings

We were told the other day that an estimate of the number of fastenings of all types in modern transport planes reaches the staggering figure of from 25,000 to 70,000. We have no way of arriving at a general figure and would appreciate some suggestions from those concerned with the design of such ships. The interest in the figure lies in the fact that if the number of fastenings is so large, the combined weight of these elements becomes a rather appreciable percentage of the total weight of the ship. And going still further, something can be done about reducing this weight. In fact, we have been given a workable solution.

Power Shift

Another interesting device for power gear shifting has been brought to our attention. This is an electro-magnetic unit using a suitable solenoid for producing the shifting movements. The attachments has not yet been demonstrated but looks good on paper. Gear changes may be made pre-selectively by the now familiar finger tip control.

Next Year

While it is much too early to make any detailed predictions about car design for the 1938 season, it seems rather unlikely that '38 will be a "radical" model year. Many refinements are in the offing — improved bodies, lighter but much stiffer chassis frames. And there may be one or two automatic transmissions, probably offered as special equipment. Another few months of progress, if unhampered by further labor troubles, may give us a more specific slant.

$200,000 Prize

The James F. Lincoln Arc Welding Foundation has just issued a very handsome and complete brochure giving the rules and conditions for the contest which was described in *Automotive Industries*. Here is a great opportunity for the designer or production man to turn his talents to design for arc-welding and create, perhaps, not only a distinct contribution to the automotive field but place himself in a position to earn a rich reward. Automotive classifications are sufficiently broad to give everyone a chance—engines, bodies, frames, trailers, aircraft engines and fuselages, watercraft, functional machinery, etc. And may the best men win.

Aluminum Helps

Several new handbooks on aluminum practice issued recently by the Aluminum Co., should be of interest to engineers and production men. One of these is a revised edition of the treatise on "Riveting Aluminum" giving technical data on specific application problems. The other is a new handbook entitled, "Finishes for Aluminum." It goes deeply and most thoroughly into the various finishes in use today—mechanical finishes, chemical dip, electrolytic oxides, eletroplating, and the group of paint, lacquer, and enamel finishes. Both handbooks should be on your book shelf.

Dry Liner

Current information indicates that the new dry liners used on the larger IHC engines for the 1937 line, are centrifugally cast and heat-treated to bring out the great hardness and high physical properties of the material. The liners are made of a special cast iron alloy of nickel-chromium-molybdenum.

Industry Leads

In a discussion of our paper at the February meeting of Pittsburgh Section, SAE, one of the factory executives of Bendix-Westinghouse brought out a very interesting point. In his opinion, the development of mechanization and production equipment as encouraged by the automotive industry has made available this equipment for other industries whose volume of business could not have warranted the necessary research and development. Thus as our industry grows and progresses it stimulates modernization in all related fields. It's a very happy thought and one to which we subscribe most heartily.

Well Heated

Through circuitous channels we learn that one of the car builders is planning to supply a built-in car heating system that will really give the backseat riders a break. The layout will be developed with the aid of heating experts who claim that much can be done to harness engine waste heat more effectively. This is something well worth watching.

Four Sticks

One of the current developments in cylinder honing is the use of four-stick hones instead of about twice that many abrasives. A large truck builder has just equipped all his honing tools with four-stick hones. —J. G.

New Developments

Trimming Press

300-Ton Double Geared Machine Has Air Operated Clutch

A 300-ton double geared trimming press with air operated clutch has been added to the line of trimming presses made by the Chambersburg Engineering Co., Chambersburg, Pa.

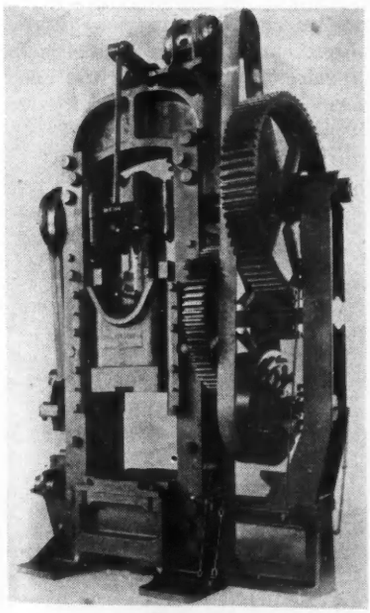
The new air operated clutch makes the machine easy to control, and provides automatically a safety slip in the event of excessive overload. Some of the specifications of the machine are: stroke, 8 in.; adjustment, 5 in.; bolster thickness, 5 in. (left to right, 37 in. and front to back, 40 in.); ram face (left to right, 30 in. and front to back, 30 in.); distance between frames, 40 in.

Wire Gages

New Van Keuren Set to Measure Pitch Diameter of Involute Gears

The Van Keuren Co., Watertown, Mass., has placed on the market a set of gear wires which are suitable for measuring the pitch diameter of either 14½ deg. or 20 deg. involute gears of any number of teeth from 9 to 200.

This new system of gear wires is based on formulae given by Buckingham in his book, "Spur Gears." The system involves the use of a series of wires whose diameters are inversely proportional to the diametral pitch, tooth factors for different numbers of teeth from 9 to 200, and values of cos 90 deg./N for use in measuring gears with odd numbers of teeth. Complete formulae and tables showing how to make pitch diameter measurements are furnished with the set.



Chambersburg 300-ton double geared trimming press with air operated clutch

Lathe

Machine Designed for Flexibility and Economy in Tooling

A new model Lo-Swing Imp lathe has been announced by the Seneca Falls Machine Co., Seneca Falls, N. Y. Added features are said to permit greater flexibility and economy in tooling, and to provide a design engineered to take advantage of the use of cemented Carbide tools.

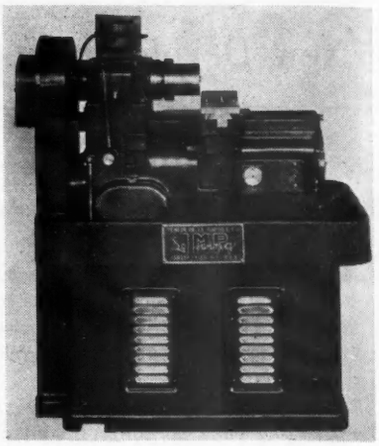
A long bearing on the carriage is obtained through the headstock design which permits the carriage slide to pass under it. The carriage is mounted on a flat and a vee way. Longitudinal movements are obtained by a drum cam. An end cover plate facilitates the quick removal of this cam and permits timing the machine for automatic stopping and easy adjustment

of the cams for carriage cross feed when used.

Feeds from .0005 in. to .05 in. per revolution are obtained by means of pick-off gears. The finer feeds are desirable for diamond turning.

The spindle is mounted on precision preloaded ball bearings and is so constructed that spindle speeds up to 5000 r.p.m. may be maintained.

Although the machine illustrated is equipped with a magnetic chuck for facing discs, this lathe may be equipped with a tailstock for between-center work. The tailstock may be arranged for lever or air operation and also provided with a quill carrying a built-in revolving tail center if desired. The Lo-Swing Imp. swings 9¼ in. over the carriage, 4 in. over the cross slide, and takes 8 in. between centers.



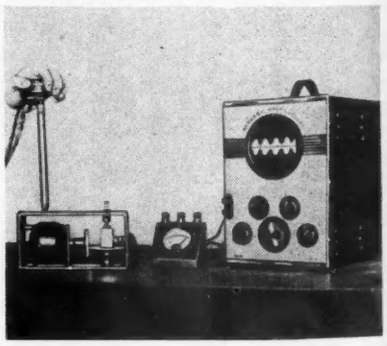
This new model Seneca lathe swings 9¼ in. over the carriage, 4 in. over the cross slide, and takes 8 in. between centers

Vibration Pick-Up

Linear Response With Sundt Device Up to 2500 Cycles Per Sec.

A new inertia-type crystal vibration pick-up, the Model 156, has been announced by the Sundt Engineering Co., Chicago. The bimorph crystal used is mounted inside of the aluminum case and has no direct mechanical connection with the prod. When the case, which weighs only 4 oz., vibrates, the crystal flexes by reason of its own inertia and sets up voltage impulses of exactly the same wave form as the mechanical motion. The response is said to be practically linear up to the resonant frequency of 2500 cycles per second. The output sensitivity is relatively high, 2 volts R.M.S. with an amplitude of 0.001 in. at 400 cycles per sec. An 8-in. duralumin test prod is provided.

Model 156 pick-up is used in conjunction with the Model 150 Neobeam oscilloscope, which has a built-in amplifier and a voltmeter on the output, to determine the frequency, amplitude, and velocity of vibration. Since the voltage output varies as the square of the velocity, the same as the vibration energy, the voltage as read from the output of the Neobeam oscilloscope, is a direct function of the energy. Very small vibrations, such as those of watches, are made audible with the



Sunco Model 156 vibration pick-up and Model 150 Neobeam oscilloscope

speaker attachment shown in the illustration.

Following is a partial list of applications of this set-up: Production testing of ball bearings, crankshafts, gear trains, and fans; locating a source of vibrations in reciprocating or vibrating machinery, checking the relative smoothness of surfaces, such as those of paper, polished metal, gages, glass plate, etc., and determining the relative efficiencies of materials for deadening sound.

Threading

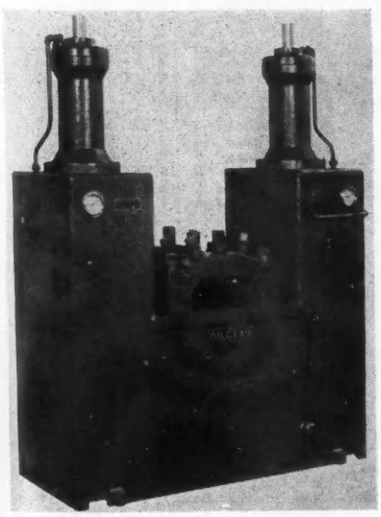
Landis Improves Design of 2-in. Machine

An improved design of the Landis 2-in. threading machine is now being marketed by the Landis Machine Co., Waynesboro, Pa. The improvements apply to both the belt and the motor-driven machines.

Power is delivered to the belt-driven machine through tight and loose pulleys mounted on the main drive shaft to be driven directly from a line shaft and without a countershaft. A belt shifter is provided for starting and stopping the machine.

Speed changes are effected through a pick-off gear box located on the headstock, and the machine is supplied with gears to cover a speed range of 31 to 118 r.p.m. With the exception of the lowest two speeds, by simply reversing the gears each set will provide two speeds. The motor on the motor-driven machine is connected to the gear box by a silent chain drive.

The new model is furnished with either the Landis standard rotary die head or the heat-treated Lanco head.



Oilgear machine for twisting airplane propeller blades into shape

Propeller Twisting

Airplane Blades Formed On New Oilgear Machine

Airplane propeller blades ranging in sizes from 6 in. wide by 1 in. thick to 14 in. wide by 4 in. thick can be twisted into shape on a new machine designed and manufactured by the Oilgear Co., Milwaukee, Wis.

A floating twister arm located in the center of the machine frame is supported in normal starting position by two cage springs, one on each end. The twister arm is equipped with three screws for clamping the propeller in place and a self-adjusting support block which adjusts itself to lower propeller contour. Two vertical non-differential hydraulically interlocked cylinders apply an equal force to each end of the floating twister arm.

One stationary clamp is mounted on each side of the twister arm. These are equipped with three screws each for clamping the propeller. Side adjustment is also provided so the distance between the twister arm and the stationary clamps can be varied to suit the point on propeller to be twisted.

Surface Grinder

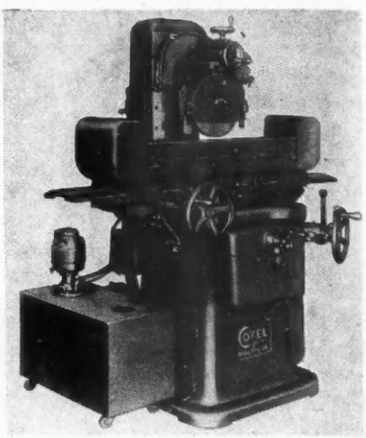
Table Speeds of 90 Ft. Per Min. With New Covel Machine

A new hydraulic feed surface grinder has been brought out by the Covel Manufacturing Co., Benton Harbor, Mich.

Table speed of the machine is variable from 10 to 90 ft. per min. According to the manufacturer, the table will reverse without shock at top speed. The alloy steel, cartridge-type, direct motor-driven spindle runs in precision ball bearings and is supported by a sturdily constructed head to minimize vibration. Spindle and rotor are balanced as a unit.

The elevating handwheel is placed at the working level of the machine and at the operator's right. With this arrangement the operator can quickly sight the surface to be ground and can look down on the graduations, reading them easily. A wheel-truing device can be built into the head and with this optional equipment it is unnecessary to disturb the set-up on the table or magnetic chuck when dressing the wheel.

Some of the specifications of the machine are: Capacity for work 24 in. long, 8 in. wide, 11 in. high, under a 12-in. wheel. (Removal of dust guard affords 2 in. additional height.) Feeds —traverse travel automatic up to .175 in. per reversal of table. Hand vertical feed graduated in .0005 in., spaced 5/32 in. apart.



Covel hydraulic feed surface grinder with table speeds up to 90 ft. per min.

Prices, Weights and Wheelbases of 1937 Cars

(Continued from page 569)

BODY, MAKE AND MODEL	No. of Pass.	No. of Doors	Delivered Price	Shipping Weight	Wheelbase	Rear Axle Ratio
PONTIAC— cont.						
Touring Sedan	5	4	861	3235	117	4.37
De Luxe-Eight						
Business Coupe	2	2	812	3270	122	4.37
Sedan	5	2	848	3330	122	4.37
Sport Coupe	2-4	2	868	3275	122	4.37
Touring Sedan	5	2	874	3345	122	4.37
Cabriolet	4	2	940	3275	122	4.37
Sedan	5	4	894	3380	122	4.37
Touring Sedan	5	4	920	3375	122	4.37
STUDEBAKER						
Dictator						
Business Coupe	3	2	765	2965	116	4.55
Custom Coupe	3	2	820	3005	116	4.55
Custom Coupe	3-5	2	845	3045	116	4.55
Cruising Sedan	5	4	880	3140	116	4.55
Custom Sedan	5	4	900	3130	116	4.55
St.Reg. Cr. Sed.	5	2	850	3100	116	4.55
St. Reg. Cu. Sed.	5	2	870	3100	116	4.55
President						
Custom Coupe	3	2	1085	3510	125	4.55
Custom Coupe	3-5	2	1115	3540	125	4.55
Custom Sedan	5	4	1165	3620	125	4.55
Cruising Sedan	5	4	1185	3635	125	4.55
St. Reg. Cu. Sed.	5	2	1135	3600	125	4.55
St. Reg. Cr. Sed.	5	2	1155	3610	125	4.55
TERRAPLANE						
De Luxe 6-71						
Business Coupe	2	2	695	2670	117	4.11
Coupe	3	2	715	2715	117	4.11
Brougham	6	2	735	2830	117	4.11
Tour Brougham	6	2	755	....	117	4.11
Victoria	3-5	2	760	....	117	4.11
Sedan	6	4	790	2865	117	4.11
Touring Sedan	6	4	810	....	117	4.11
Conv. Coupe	3-5	2	835	2765	117	4.11
Super 6-72						
Coupe	3	2	795	2755	117	4.11
Brougham	6	2	815	2875	117	4.11
Tour. Brougham	6	2	835	....	117	4.11
Victoria	3-5	2	835	2795	117	4.11
Sedan	6	4	865	2905	117	4.11
Touring Sedan	6	4	885	....	117	4.11
Conv. Coupe	3-5	2	905	2825	117	4.11
Conv. Brougham	....	2	985	2915	117	4.11
WILLYS						
Coupe	2	2	491	2120	100	4.30
Sedan	5	4	545	2250	100	4.30
De Luxe Coupe	2	2	535	....	100	4.30
De Luxe Sedan	5	4	590	....	100	4.30